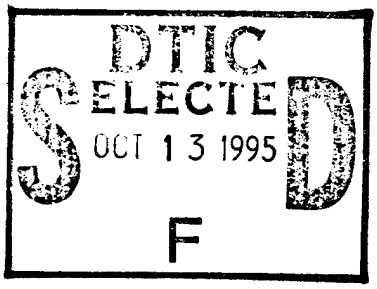
IDA PAPER P-3041

INFORMATION AGE TRAINING: CONVERTING POTENTIAL TO PERFORMANCE



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INSTITUTE FOR DEFENSE ANALYSES
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FOREWORD

This paper assesses both the ongoing training challenges and the corrective actions underway as the Army moves to create the training required to enable Force XXI. This assessment as well as the subsequent policy recommendations were taken as part of a continuing project to double or triple both effectiveness and efficiency of training in Total Force combat maneuver units.

This is the fourth paper in the project. The first study (IDA Paper P-2611) developed a general model but was limited to one application, U.S. Army National Guard Armor Units, Company and Below. The scope of the second study (IDA Paper P-2785) extended the focus to propose training policies and programs for Total Force Maneuver Battalion and Brigade staffs concurrent with ARPA development of the appropriate enabling technologies. The third study (IDA Paper P-2947) proposed a new framework for the structuring of the training itself to take advantage of new capabilities—a framework now embedded in the Training Support Packages (TSP) of Army Warfighter XXI. This fourth study describes the training development that must occur to create the training programs for the Total Force. It also suggests appropriate policies for execution.

Much that has been advocated in the preceding three papers has been accepted as training policies and program in Warfighter XXI (WFXXI) (Enclosure 1). As a result there is an operational cast to this paper not found in the earlier efforts. The recommendations are currently under review.

With this conceptual effort and, more important, the aggressive application of that which has been proposed by the Army, attainment of the ultimate goal of unprecedented improvement in both effectiveness and efficiency of training moves from possible to likely.

Information Age training of landpower is coming.

PREFACE

This paper was prepared by IDA as part of its work on Advanced Distributed Simulation for the Advanced Research Projects Agency under ARPA Assignment A-132.

The paper describes current training development activities in the Army and proposes specific policies to reshape existing training development requirements, particularly those relating to mounted Battalion and Brigade Task Force proficiency in collective training.

This effort draws on the collective support and wisdom of individuals of all grades who have eagerly contributed. Several who have been particularly helpful are: BG Bert Maggart, DCG The Armor Center; BG Pat O'Neal, now C/S III Corps, earlier COG, NTC; BG Stu Wallace, Director of Training, DCSOPS, Hq DA; BG Joe Frazar, ADCST-W TRADOC; Dr. Jack Hiller, Director, Training Systems Research, ARI; and Neale Cosby, Director, IDA Simulation Center. They have been reinforced exceedingly well by COLs Scott Marcy and Scott Miller, DAMO-TRO and TRS; CTC COGs: COLs Scott Wallace at the NTC, Paul Lenze at the CMTC, and Bruce Barlow at the JRTC; COL Dave Marlin, Director, BCTD CAC; COL Jim Gunlicks, Director, TDAD ODCST, Fort Monroe; and the ARI Team of Drs. Black, Quinkert, and Burnside at ARI, Fort Knox.

Special thanks to readers who provided very thoughtful and useful comments. They are: General Ed Burba (USA, Ret.), Dr. Jesse Orlansky, Dr. Jack Hillier, Dr. Barbara Black, and Dr. Steve Goldberg. They are experts; I have included some of their remarks.

I of course am totally responsible for the paper—acts of commission and omission.

CONTENTS

FIGURES

EXECUTIVE SUMMARY

This paper discusses the challenges facing the training developer today and suggests new policy directions to facilitate the second "training revolution." The challenge is to convert the clear potential of distributed Tactical Engagement Simulation (TES) to demonstrated performance of combat units, evolving to the conduct of Force XXI Operations.

An introductory Overview reviews general aspects of unit training, then analyzes current training development both in concept and as it is emerging for the Total Force. Challenges addressed are the training of battalion and brigade staff officers, incorporation of digitization of the force, and determination of the proper training mix of live, constructive and virtual simulation. A new systemic model is proposed for training consisting of training policy, training development and training support, which could synchronize the melding of training development into information age material development, combat development, and force development.

Next, the paper discusses major shortfalls existing in both doctrine and practice of training development for training in units today. A comprehensive vision of training in units is required to permit increases in both effectiveness and efficiency of training. Training requirements need to be related to a credible resource generation methodology so that training associated with Force XXI development can be enabled. Addressing some of the shortfalls raised could make a significant difference in the quality of unit training at modest cost for development and implementation.

Genuinely new capabilities and requirements are then addressed, which are characteristic not only of the post Cold War international situation but also of the accelerating impact of new information technologies. There are exciting challenges: improving battle staff training; taking advantage of new opportunities for distributed seamless TES in the Synthetic Theater of War (STOW); creating a living training development process, in which new training for warfighting uses horizontal digitized information as part of the major Army effort to "digitize" the battlefield [Force XXI Battle Command Brigade and Below (FBCB2)]; and preparing leaders, individuals, and units for new missions such as Operations Other Than War (OOTW)—all in the context of Warfighting XXI. There is

currently a training development gap or, at best, the potential of significant opportunity overlooked in each area. However, there are also significant resources available by "piling on" existing programs.

Together these various issues constitute the challenge of converting potential to performance in training development. The final chapter concludes the following:

- There is a substantial backlog of training development to be updated, while genuinely new requirements, particularly those associated with force digitization, are met.
- New training development doctrine is required to correspond to the emerging requirements of the information age.
- Existing funded programs that require improved training development can provide many of the resources needed.
- There are opportunities to take advantage of new training capabilities created since the training revolution of the seventies—distributed TES and the Combat Training Centers (CTCs).
- Systemic training development problems mandate long term strategic governance and broad involvement across major commands.

The paper recommends five specific policies:

- *Initiate finite actions.* Create training development products to solve explicit, immediate problems.
- *Update training development doctrine.* Review and revise both existing training doctrine and the largely Industrial Age practices developed with the first training "revolution" as the Army rebuilt after Vietnam.
- *"Pile on" to generate resources for training development.* Training development [trained task, condition, and standard (TCS)] is the glue tying together new developments (material, force, combat). Tie the completion of training development to existing, funded spiral development models.
- *Generate new Information Age training development capabilities.* New training infrastructures such as the CTC with highly competent Observer/ Controllers (OCs) offer new potential for executing imaginative and timely training development.
- *Establish consistent long-term governance.* Some consistent policy and program overwatch that draws on external expertise seems appropriate at least until the Army recreates an Information Age training development system.

A recommendation: *Implement these policies as appropriate to the training development challenge sensed at each echelon and locale.*

I. OVERVIEW

The Department of Defense and all of the Services are moving aggressively to exploit opportunities for improved training created by Tactical Engagement Simulation (TES) spread globally by Distributed Interactive Simulation (DIS). It seems clear that just as the Information Age presages new national capabilities and defense challenges, it also offers new opportunities to train military forces. Although the potential is evident, converting training potential to reality of fielded, trained forces performing to standard under stress is another matter entirely. New technologies, however impressive they appear, do not in themselves cause effective training to occur. They must be matched with effective training programs tailored to the individual and collective needs of soldiers, sailors, and airmen. Success in training has lagged well behind evident accomplishments in distributed information technologies. Combat readiness of forces suffers accordingly.[1]

Although the readiness challenge is real and pressing for each of the Services, the toughest training problem rests with the Army. The Army does not have uniformity of air or sea as a combat medium and is not able to group personnel into aggregated fighting units (aircraft or ships). Training of the individual soldier or team preparing for combat across the spectrum of conflict in the infinite variety of global terrain is the toughest Information Age training challenge in the DoD. It is the focus of this paper.

The Army is embarked on a path of accelerated transition to future warfighting, called Force XXI, as expressed in recent doctrinal publications.[2] There is also an Army Training XXI recently renamed Warfighter XXI (WFXXI) with an emerging vision of how the Army will train in the future. This vision of a comprehensive system comprises the elements of training manager [the Standard Army Training System (SATS)]; training generator [Training Support Packages (TSP)]; training event enabled by Training Aids,

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1 This personal observation is based on extensive observation of small unit training at the National Training Center, the Combat Maneuver Training Center, and the Joint Readiness Training Center 1993–1995.

2 Headquarters, Department of the Army, FM 100-5, *Operations*, Washington, D.C., 14 June 1993; TRADOC Pamphlet 525-5, *Force XXI Operations—A Concept for the Evolution of Full-Dimensional Operations for the Strategic Army of the Early Twenty-First Century*, Fort Monroe, Virginia, 1 August 1994.

Devices, Simulations and Simulators (TADSS); training result [Standard Army After Action Review System (STAARS)]; and an interactive data Library.[3] Each part is important. All except the training generator element have TRADOC as a designated, responsible proponent in the Army organizational structure. Responsibility for developing the Training Support Packages or structured training exercises is not clearly fixed, leading to general deficiencies in both design and execution of Army training development overall and for unit training in particular. This paper examines the unit training development for Warfighter XXI.[4]

There are serious deficiencies in the training of small-unit staff officers. Unit commanders know they have a training problem; however, most do not realize how serious the problem is, why it was created, or how best to fix it. The training system has not prepared remedial corrective training. There are other current training issues such as leader training to employ advanced information systems. Most relate immediately to the Army, but they apply to both Joint Task Force (JTF) and Combined Joint Task Force (CJTF or CTF) operations.

In several cases, new training perspectives are required. Training of staffs above company has commonly been seen as a process of horizontal training by echelon. That is, battalion, brigade and division staffs had to be trained to work together at that echelon to common purpose, executing the commander's intent. The customary requirement is that each echelon has to be trained to work as a team that coordinates horizontally at that echelon across areas of staff responsibility—G1/S1 with G2/S2 with G3/S3, etc. Now, as doctrine develops which approaches warfighting as the integration of various functions or Battlefield Operating Systems (BOS) such as Fire Support, Intelligence, Battle Command (focusing in time and space), it is apparent that there are teams of staff officers who must also coordinate vertically from the lowest to the highest echelon.

For example, suppression and obscuration in a deliberate brigade breach of an obstacle may require close coordination of fire support from company Fire Support Team (FIST) to corps artillery to employ sufficient multiple-launch rocket systems (MLRS), even higher if Air Force Close Air Support is to be employed. Intelligence/Electronic Warfare (IEW) is increasingly broadcast from theater or national echelons drawing on All Source

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3 TRADOC-BCTD, CAC, *A Vision for Army Training*, Version 1, 23 September 1994, at Enclosure 1.

4 See Frederic J. Brown, *Training Third Wave Landpower: Structured Training*, IDA Paper P-2947, December 1993, for background.

Assessment System (ASAS) capabilities. The Mobility Survivability team extends from the engineer company supporting the maneuver battalion to at least corps echelon when substantial bridging is required. The Forward Logistic Element (FLE) supporting a brigade may consist of corps or echelons above corps assets. Determining who trains these vertical teams in what tasks, and how often is essential to the success of WFXXI.

Consider the training implications of tactical information linking battle command both horizontally and vertically on the battlefield. The M1A2 with the InterVehicular Information System (IVIS) is just the beginning, in terms of new training, of the requirements which will be placed on commanders of the maneuver arms, fighting from their armored fighting vehicles (AFV) and supported by smaller staffs of varying composition.

Another new perspective emerges as JTF deploys in Operations Other Than War (OOTW) when the conventional, balanced combat, combat support (CS), combat service support (CSS) troop list of cold war planning (Capstone) days is replaced by just that functional capability required to dominate the mission, enemy, troops, terrain, and time (METT-T) of the commitment, such as CSS in Rwanda or Somalia. Recently, forces deployed have been both functionally weighted and *ad hoc* in that both units and staffs were assembled in new organizational combinations to deploy. Even within a BOS *ad hoc* units are created. Ten or more separate signal units were combined to develop the precise communications capabilities required by the 10th Signal Battalion in Somalia. Intelligence capability is similarly tailored. This is a substantially new perspective of training requirements for both staffs and units. Determining how that perspective of task force creation unique to explicit requirements of each contingency influences the design of training for force projection is also essential to the success of WFXXI.[5]

The process for developing training for units is ill-defined because there is no taxonomy or structure to guide the development of the training. The doctrinal Field Manual FM 25-100 is excellent in laying out the broad principles of the Army training system. Although there is substantial material available on the Systems Approach to Training and ample TRADOC documentation on institutionalization of training in the school house, there is no overarching system or concept for the development of training to be conducted in units.

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5 This is primarily a combat support, combat service support problem. Combat organizations deploy intact, as organized, although frequently filled with personnel at the last minute. But cohesion of leader teams, essential to success in ground combat, is maintained.

The United States is superb at creating remarkable training aids to support the conduct of training (training support); however, the training development system must still determine the explicit way to train to task, condition, and standard (TCS) as well as the requirements for incorporation of training aids to both train and sustain proficiency. Once training needs are analyzed and defined under TCS, the role of individual TADSS needs to be conceptualized. Given the availability of this imagined TADSS, at least one "good" training strategy (a way) needs to be constructed that is realistic in terms of resource availability (time, funds, ammunition, ranges, TADSS). DA policy and resourcing govern what is possible. TRADOC training strategists and HQDA policy and resource managers will need to negotiate training strategies.

These negotiations will shape, for better or worse, the tactical proficiency of the landpower component of the deploying JTF and CTF.

The paper discusses several general aspects of unit training and reviews current training development both in concept and as it is gradually emerging for the Total Force. Much of the analysis of training is grounded in the challenges of training Army National Guard (ARNG) combat forces having a severely constrained resource environment. ARNG concern about combat maneuver training deficiencies after Desert Storm was the stimulant for this research in unit training for ARPA and the National Guard Bureau.[6] Other papers prepared during the past 4 years also address these problems.[7] Now, 4 years later as tangible products appear, success in meeting the development challenge appears quite promising. A second training revolution is underway.

This perspective of training development directed at improving effectiveness and efficiency of resource-constrained training is doubly valuable today. More missions arise for all forces in the guise of OOTW. Now the active force, particularly but not exclusively in Europe, is as constrained in training area availability as the ARNG.[8] Thus, there is significant overlap of training challenge within the Total Force which encourages—in fact mandates—addressing both active component (AC) and reserve component (RC) training

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6 Frederic J. Brown, *A Simulation-Based Intensified Training Readiness Strategy For The Reserve Component*, IDA Paper P-2611, December 1991. The broader underlying challenge was to create a doubling or tripling of both effectiveness and efficiency of Army training in units—a suitable ARPA-like challenge.

7 *Battle Command Staff Training*, IDA Paper P-2785, December 1992; *Training Third Wave Landpower: Structured Training*, IDA Paper P- 2947, December 1993.

8 Faced with multiple simultaneous missions, many out of country, and new leader training requirements associated with digitization, time for unit training may be about to become as scarce for AC as for RC.

as one problem. An ARNG training "solution" is likely to be absolutely applicable for the AC. The reverse may or may not be the case—a source of some confusion in training development which will be discussed below.

The second part of the paper discusses major deficiencies in both doctrine and practice of training development for training in units today. There is very little internal Army (Title 10) training development capability remaining, and much of the training material now available in units dates from the late seventies. It was good then—in fact, world-class—but both requirement and ability to train have moved on. Addressing some of the shortfalls raised below could make a significant difference in the quality of unit training at modest cost for development and implementation.

Next addressed are the genuinely new capabilities and requirements characteristic not only of the post cold war international situation but also of the accelerating impact of new information technologies. There are exciting challenges: taking advantage of new opportunities for distributed seamless Tactical Engagement Simulation (TES) in the Synthetic Theater of War (STOW); designing new training for warfighting drawing on horizontal digitized information as part of the major Army effort to "digitize" the battlefield [Battle Command Brigade and Below (BCB2)]; and preparing leaders, individuals and units for new missions such as OOTW. There is currently a training development void or, at best, the potential of significant opportunity overlooked in each area.

A. BACKGROUND

The current rate of change to the art and science of employment of the military instrument of policy is remarkable. No training development initiative can be credible if it does not acknowledge—even thrive on—endemic change. The Army is moving ahead well under the leadership of the Chief of Staff to move to the doctrine, organizations, training, material, and personnel necessary for Information Age warfare in the next century. Summed as Force XXI, the only certainty is change. Figure I-1 portrays the challenges for the training of units and for the tasks of the training developer addressing the training required by future forces.

Discussions of unit training, new capabilities, and requirements relate to practical issues. For example, generating combat power by a short fuze redeployment from a lower priority mission with the unit "reorganized, retrained and redeployed" enroute is a major leader and unit training requirement even if all of the individual soldiers were superbly

"We will quickly generate combat power in warfare. Active forces engaged overseas in lower priority missions may be recalled, reorganized, retrained, and redeployed" (p. 20)

"Tactical-level leaders . . . must be prepared to make decisions, such as those involving rules of engagement and others that may have major strategic consequence, under the scrutiny of international media" (p. 4-4)

". . . staffs may not be constant in size, but be tailorable to the mission" (p. 4-5)

Leaders must be skilled in ". . . tactical and technical competence and consistent building of cohesive teams" (p. 4-5)

Organizations at lower levels perform ". . . joint and multiservice functions previously conducted at much higher levels" (p. 4-6)

Reference Peacekeeping: "The capabilities we provide will be carefully tailored, usually to reinforce and supplement the resources of our international partners" (p. 11)

Figure I-1. Characteristics of Force XXI Operations per TRADOC Pam 525-5, 1 August 1994

trained in the individual tasks associated with their Standard Reporting Code (SRC) or military occupational specialty (MOS). An ARI-developed rapid Train Up M1 Armor package, with updates, was used successfully during Desert Storm.[9] TRADOC thereafter directed its schools to develop comparable packages using the methodology developed by ARI, but scarce resources precluded execution of this concept. The need remains.

The requirement for staffs, "not constant in size," but "tailorable to the mission" is a logical result of composing forces with the overwhelming capability to dominate the situation generating the force projection. The need exists for supported staff training today for *ad hoc* staffs formed in the Marshalling Area or at the Intermediate Support Base (ISB).

Units at lower levels performing "joint and multiservice functions previously conducted at much higher levels" has occurred frequently, most recently in Operation Provide Comfort and the UN operations in Somalia. However, there is no institutional or unit training designed to prepare for this in practice, nor is there any guidance on how best to accomplish these substantial training requirements in the Army training doctrinal publication FM 25-100.[10]

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9 Drucker, E.H., "The Development of a Rapid Train Up Package and Platoon Level Scenarios for Armor Training in the Army National Guard," ARI Research Note 92.08. This general effort to intensify training started in early 1978.

10 Innovative training is underway at CMTC and JRTC with varying mixes of Joint, combined, and nongovernmental organizations but to date these, in each case, respond to a specific request from a unit commander, not the result of Army-wide training policy. A significant training capability is yet to be fully realized. See the CTC discussions in Chapter V.

Actually the scene is not as bleak as it might first appear. Clearly excellent, innovative training is in fact being conducted today by leaders and units facing these kinds of actual mission requirements. The 1st Armored Division training for Military Operations Other Than War (MOOTW) at the Combat Maneuver Training Center (CMTC) in Germany is an excellent example, as is the 1st Infantry Division training on Reception, Onward Movement (ROM) at the National Training Center (NTC) or the 2d Armored Cavalry Regiment training in Peacekeeping Operations at the Joint Readiness Training Center (JRTC). Good people will respond. Professionals who are provided solid general training doctrine will develop new forms of training. The point is, however, that the Army faces a training development deficit today for very basic individual and collective tasks, such as using new technologies to train AFV crews for today's battlefield requirements. Add to that the widening gap of genuinely new training requirements generated by the Information Age, and the challenge is formidable.

The complexity of the battlefield expressed in FM 100-5 and TRADOC Pam 525-5, combined with the great and growing cost of training to standard, result in a pressing need to structure the training processes. Extensive live-fire training exercises are desirable to some, but they are no longer feasible for many units above Platoon echelon. Complex BOSs have to be trained thoughtfully, prudently, and to standard. To be successful, this training must be the result of considerable planning and preparation. The challenge is not just to sustain and reinforce the initiative desired in the U.S. combat leader. When much of the training has been organized in great detail (structured) by superiors, it is also a substantial challenge to retain the freedom to fail but learn from that experience on the part of the young sergeants and officers. All training cannot be structured by higher echelon. The objective training system must give the Platoon Leader the opportunity to try his or her solution, fail, fix it, and try again. Retaining this flexibility in the face of resource constraints is genuinely difficult, and structuring is still essential.

Training development is one aspect of research essential to defense readiness in the next decades. It is one area where civilian application is direct and immediate, so payoffs from tangible products are doubly productive. Notice that by and large the focus of inquiry is application of new technologies, primarily, but not exclusively, distributed interactive simulation employed to train leaders and teams in units. DoD school house training is not addressed directly because it tends to be the focus of the institutionalized training infra-structure in each of the Services. Joint warfighting applications are not addressed specifically. They are pervasive throughout all of this training development. For example, all staffs must be trained to be Joint or combined.

The Army continues to move rapidly to seize tactical advantage from the digital future. Force XXI exploits the prospect of having more appropriate battlefield information passed more rapidly than other armies.[11] Force XXI Battle Command Brigade and Below (FBCB2) proceeds as one of the few major DoD acquisitions to create horizontal data integration across tactical forces.

The concepts are visionary; however, baseline assimilation of existing digital information systems has not been good. Success will require a much greater degree of personal computer literacy by officers and noncommissioned officers than has been the case to date. The record of use of digitized systems ranging from Tactical Fire Direction System (TACFIRE) to Unit Level Logistics System (ULLS) to the Maneuver Control System (MCS) is mixed. Consider the absence of effort to understand and train use of multiple information sources in the flagship Information Age system, the Abrams M1A2. Until computer application proficiency (evaluated frequently to standard) joins physical fitness and weapons qualification as part of non-negotiable leader proficiency so that the default, under stress, remains digital, practical assimilation of the "digital" future appears questionable.

Furthermore, the connectivity foreseen in the Congressional report (see Figure I-2) will require breaking down institutional barriers from one branch or function to another. For example, accelerated vertical and horizontal information flows override traditional areas for proponency within the Army just as longer range acquisition and targeting blur traditional long range fire support responsibilities between Services. During the 1994 horizontal integration trials at the NTC, it became evident that very open, freely accessible, networking was a very promising development path.[12] Today that information sharing is digital voice. Tomorrow it can be audio, text, or image. That capability alone will change significantly both formal and informal flows of information.

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11 UCOFT (Unit Conduct of Fire Trainer) certification was a very challenging training requirement to the average AFV crew 10 years ago. Today, it is just another routine training requirement. This general computer familiarity is a national advantage comparable to U.S. soldier familiarity with mechanization (farm vehicles and autos) in World War II. Conversation CG 1st AD, CMTC, November 1994.

12 An observation gained personally and shared as a quasi Observer/Controller (OC) on the ground during the entire trial rotation. The tacit model was the OCCS, an open system used by the OCs, i.e., any voice net is accessible to any OC at any time

"The computer industry, and the visual entertainment and education industries, are rapidly merging. They are all converting to high resolution images . . . and are using high speed digital technology for signal processing, signal recording, and signal distribution."

House of Representatives,
Subcommittee on Technology and Competitiveness,
May 1991

How to take advantage of this future?

- Convert connectivity potential to performance
- Create then exploit synergies—best are those paid for by others

Figure I-2. Technology Direction—The Digital Future

Comprehensive training programs should be developed to take advantage of these information sharing capabilities. This development cannot occur unless proponents view technology as a system for processing—storing, retrieving, transmitting, etc.—information and not simply as receivers, transmitters, etc. The point is that establishing new connectivity will be very difficult, and training development seems certain to continue to lag unless extraordinary actions are taken.

Reduced budgets contribute to the problem. It is likely that the majority of Information Age capability which comes to the military will be that commercially developed for civilian industry. The great challenge for each Service will be to determine the applications for which converting extensive, expensive, commercial capability to military purposes is required. Then the challenge is not to stop with the conversion but to develop suitable training programs such that the latest, bought by industry, is in fact trainable and fully usable by typical warfighting units, be they single Service, Joint, or combined. Few manufacturers design collective training for commercial applications. For military applications, a training development responsibility is essential.

B. FBCB2 CONNECTIVITY

Information connectivity across heretofore unconnected areas is a primary objective of the FBCB2 acquisition program. Several examples follow of what FBCB2 connectivity might be able to provide to landpower.

The first major connectivity aspect is that the staff tasks trained to proficiency in current staff simulations [BBS (Brigade/Battalion Simulation) or JANUS (Joint Analog Numeric System) or CCTT (Close Combat Tactical Trainer) when fielded] are the same tasks which must be supported by the operational FBCB2. Although this seems obvious,

the convergence has not been evident. Staff task definition has been fragmentary. When tasks are defined, the operational information system (FBCB2) should support their execution. Therefore, successful staff task execution (as well as small unit execution) should be one of the measures of performance expected from FBCB2. Not all tasks possible in the infinity of METT-T in a globally projected Army can be included, but certainly a representive set can be replicated precisely in simulation and then modified as doctrine, tactics, techniques, and procedures evolve. With this explicit, objective performance statement—TCS—industry has just been provided a focusing vehicle for the training of a development team of contractor and subject matter experts (SME) as well as a common vehicle for evolving preplanned product improvements. A task-based unit training system is converted to training the industrial development team.

The connectivity of staff training to material development seems to go much further. TCS provide an explicit blueprint for the creation of the objective operational software. Training development creates the Information Age pattern for the successful movement of information which is the final software requirement for the fielded FBCB2.[13] Successful task performance to standard in training/evaluation is the objective of training in units. Again, the purpose of FBCB2 is to produce successful battlefield performance. Staff TCS both define successful performance and enable its execution. FBCB2 which produces staff task proficiency to standard is successful FBCB2.[14]

Because development centers on the transfer of timely information, that transfer becomes the focal point of every aspect of development. Information Age training development which produces TCS also produces the material development blueprint. It also embeds the what, how, and why of the warfight—the traditional combat development perspective—as well as influencing the objective organizational structure, the province of the newly created Battle Labs. That blueprint is then confirmed using a spiral development methodology with the commander, staff, and other unit personnel simulated "in-the-loop." Doctrine (TRADOC Pam 525-5) extols "force coherence through shared knowledge." That coherence is enabled by the convergence of information shaped by task, condition, standard defined for staff and small unit warfighting performance. That is one example of new connectivity promised by the digital future.

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13 See Enclosure 2 for a perceptive description of this by the DCG at the Armor Center.

14 There are of course very difficult hardware and networking issues which must be solved in FBCB2. I do not underestimate these but they are traditional industrial requirements understood by the material developer. The dominance of TCS through software is not. The lure of simply "building radios" is strong.

Several other less theoretical and more practical examples of potential connectivity are new cross-functional capability that the digital future provides to the AFV or the individual light infantryman. The M1A2 Abrams directly ties maneuver and fire support. Knowing where the target is by onboard position location and lasing to a target determines target location. IVIS can send the Call for Fire to the guns and thereby speed up the responsiveness of fire support enormously. Relationships between direct and indirect fire have just changed significantly for the close battle. There is a similar change for the light infantryman. Introduced by steerable parachute, equipped with position locating capability, a ranging laser, and effective, secure, communications, the trained soldier now has portability and connectivity across most battlefield functions. The individual soldier can focus firepower in a manner and quantity similar to the company or even battalion in the recent past. In each case, the new connectivity permits missions to be executed differently than in the past. But neither the assimilation nor the connectivity are present today.

A Gorman-developed paradigm (see Figure I-3) is employed throughout this paper.[15] That is, all training is simulation (until there is actual combat). There are three categories of simulation: live [MILES (Multiple Integrated Laser Engagement System) on the ground], virtual [Simulator Networking (SIMNET), CCTT] or constructive [BBS, Corps Battle Simulation (CBS), JANUS]. As noted, virtual and constructive simulations are beginning to converge. This development is very helpful. To conserve computational resources and permit timely representation of decision-making at the higher echelons, there are clear advantages to algorithm-generated constructive simulation. Yet there are times when it is appropriate to provide object-generated individual resolution even when the focus of simulation may be at the theater echelon. One example is General Schwarzkopf's concern about the preparation of individual Pave Low and Apache aircraft for the attack on early warning radars such as initiated Desert Storm. For full representation of the Commander-in-Chief's (CINC) concern—trained, rehearsed combatants for very high-priority missions—virtual simulation of the actual pilots flying the mission in appropriate simulated aircraft is necessary. Fortunately this broad range of apparently seamless simulation capability is coming.[16]

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15 General Paul F. Gorman (USA, Ret.)—a consistently accurate "visionary" influence on army training.

16 Excellent development is occurring at IST, University of Central Florida, where I observed an Army constructive model (Eagle) interfacing effectively with virtual simulation (SIMNET) both manned cabinets and semi-automated forces. Aggregation and deaggregation between the two forms of simulation appeared seamless. Visit IST, UCF, 9 December 1994. The three domains were blended effectively for training in STOW-E November 1994 but with very considerable behind-the-scenes work to create apparently seamless interfaces.

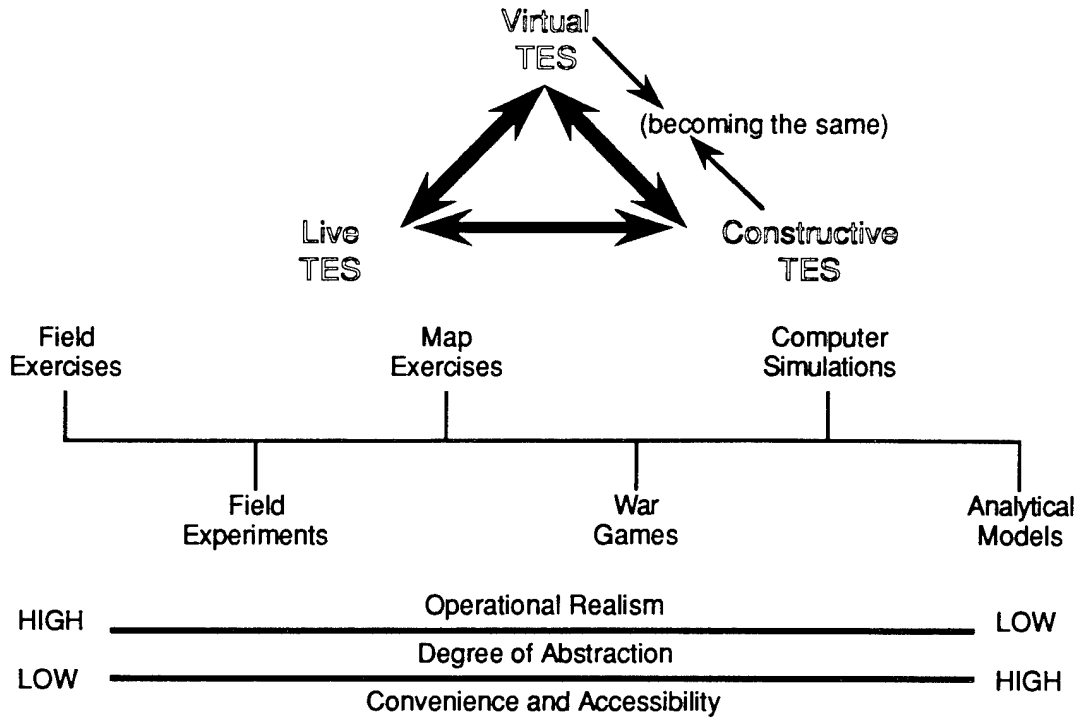

Figure I-3. Gorman Paradigm (1992)

Since simulation soon can be mixed to suit the user, it is necessary to determine (1) what form of simulation will cause the best training to occur and (2) success criteria. One of the most important criteria will be effectiveness of the training. Training research to date is inadequate in terms of assessing the relative strengths and weaknesses of each form of simulation, and the optimum mix of live, constructive, and virtual simulation. Basic research is required in this area.

C. TRAINING DEVELOPMENT ISSUES

The issue of mix is one of the basic unanswered questions which may impede rigorous, valid training development for the next several years. Answers for training to military standards may be different than those for general education. They are probably the same for both military and civilian application at least in high-risk occupations. But whatever the mix, it seems absolutely certain that the combination of proper mix combined with immersion of the training audience in the training event will produce extraordinary increases in both effectiveness and efficiency of training. Added to the rigor of TCS and the distribution potential of the Information Age, the proper mix of TES plus immersion will revolutionize training and the enabling training development methodology.

But neither newfound digital connectivity nor the acceptance of the Gorman paradigm will produce leader, staff, or unit readiness unless some guidance is provided to the training developer. For example:

- Whether institutional or unit, individual or collective, there should be careful definition of the tasks, conditions and standards to be trained.[17]
- In Force Projection operations, it is unlikely that the mix of forces to be deployed will be determined until commitment; therefore, training programs should be prepared to address active and reserve units or a mix of the two, foreign and domestic forces, etc.
- The infrastructure associated with contemporary training is substantial, particularly for collective training. Observer/Controllers need to be trained, and their proficiency maintained. MILES or comparable training support needs to be concentrated or invented. An interactive highly competent Opposition Force is desired. Some form of detailed battlefield instrumentation is necessary upon which to base After Action Reviews (AAR).
- Success should be clearly defined. What levels of training are sought? Are there specific objective Measures of Performance (MOP) and Measures of Effectiveness (MOE)? How many of which constitute what level of readiness if that is deemed to define success? If MOP and MOE are not readily available, should they be created?

Increasingly, the training product will be the subject of resource justification. That is, the product of the training must be employed to justify resources for further training or to justify continuation of the investment in training. The training developer normally should be prepared on both issues. Where possible, training should be designed to make efficient use of resources, or to raise proficiency levels, or both.

But the more serious resource issue related to training development is the provision of resources to execute the training development itself. Training development has been persistently underfunded for years, although there have been major training support acquisition programs particularly in support of mounted warfare [SIMNET, UCOFT, Platoon Gunnery Trainer (PGT)]. But there, trade-offs could be generated with existing training support, largely conventional training ammunition. Excellent work has been done by aggressive Program Managers where program success was clearly determined by the

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17 There is a major issue here in allocation of responsibility for individual and collective training between institution and unit. In general, distributed TES should permit more individual and collective training to migrate to units. However, OCs at the CTCs are part of the institution. How do/should they support the unit chain of command?

presence or absence of an effective resourced training strategy (CCTT). But this is the exception. CCTT training development to support application of the CCTT to unit training was initiated by an aggressive Program Manager supported by the TRADOC Proponent. The reverse should be the case. Until training development (particularly for leader and unit training) is recognized as an integral part of any hardware development, prospects for improvement are dim.[18]

The training environment must also be considered because personnel quality and unit personnel can change dramatically as occurred in the eighties. It is critical to determine (1) what should be done to modify training when turbulence and turnover occur, (2) whether the training can be designed to minimize the impact of turbulence on individual and collective training proficiency, and (3) how to modify routine or specialized training as new missions like OOTW appear.

The point here is that training development is complex business. If it is left to the end of the overall development process, the resulting inadequacies can and usually are compounded by increased time requirements on the training audience attempting to train to mission proficiency.[19] That can be disastrous when the training audience become Information Age commanders who need to develop personal proficiency with complex information systems to accomplish the warfighting mission.

Possibility becomes probability when the effects of gradual decay of training development in the Army and the post-Cold War build-down are added to the assessment. Considering resources required for training development, there really is no accepted systemic process in the Army today to create the training that must occur, whether it be for leaders, staff teams or the unit itself. Process here is defined as responsibility to develop the collective training, the resources to ensure actual creation of the training and its acceptance by units combined with the authority to ensure performance to standard, and the feedback loops necessary to correct inadequacies in the training programs as revealed in unit performance. Despite reductions in the support Army (TRADOC), responsibility for developing collective training is increasingly being focused at Fort Leavenworth. However, authority to monitor effectiveness is fragmented across the major commands of

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18 This is one of the more compelling reasons why the Information Age relationship between TCS and the material developer's "blueprint" needs to be recognized and supported (FBCB2).

19 Lest the reader believes this problem, which haunted units in the eighties (M60A3, Redeye, Stinger, Dragon) has disappeared, look closely at Javelin, the replacement to Dragon.

the Army, and resources to actually field the training programs in the various units remain extremely limited.[20]

The training development of the seventies and early eighties was dismantled during the past decade—the Training Development Institute (TDI), Army Training Board (ATB), and a robust unit-oriented Army Training Support Center are gone. Prospects of institutionalized training development in support of Force XXI are slim. There is no consistent advocate for training development, nor do any of the officer development programs designed to attract officer talent into the training development field continue.[21] So there is little senior leader expertise left to make the critical assessments that must precede corrective measures. Nor are there institutionalized mechanisms to blend material, force, combat and training developments.

On the other hand, the material development community thrives, and where the material development directly concerns training support—Simulator, Training, and Instrumentation Command (STRICOM)—the product is excellent. The Battle Labs gain momentum as the repositories of combat development and force development refocused to the evolving needs of Force XXI. Training development languishes; it is simply not considered part of the development team. This was demonstrated most recently in the Request for Proposal for FBCB2, which simply did not address many training development issues. The irony of failing to directly address TCS in the effort to develop a computer system that would make *undefined* TCS easier to perform well seems to have entirely escaped the attention of the material development community.

Finally, the post-Cold War build-down has reduced seriously the assets available to correct training development deficiencies. In fact, even the division of responsibilities for unit training between U.S. Army Forces Command (FORSCOM) and U.S. Army Training and Doctrine Command (TRADOC) established in Project Steadfast in the Seventies becomes increasingly tenuous. TRADOC nears the point where it may no longer have "critical mass" to undertake innovative development as it could in the past. The Combat Training Centers (CTCs) and the Army War College, and the Combined Arms Center School of Advanced Military Studies (SAMS) are clearly centers of excellence that could do

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20 Good things begin to happen for unit training development in the focus of Force XXI, with the aggressive training development by the ARNG and consolidation of responsibility from Department of the Army Military Operations–Training (DAMO-TR) down. But these are beneficial and necessary piece parts, not a maturing systemic response to the training development problem.

21 This may not be bad if a better Information Age response is creation of virtual organizations supported by SME temporary employees or contractors as discussed in Chapter V.

more to support training development but beyond them the Proponent Schools wither.[22] Increasingly focused on executing their important institutional training responsibilities, TRADOC training development to support training in units wanes—just as major change arrives with horizontal integration and Force XXI.

One certain action should be to define a taxonomy or structure for defining training requirements for the Army. Structure should be an acknowledgment that the development and fielding of all training, individual and collective in institution and unit, involves coordination of three broad areas: training policy, training development, and training support. Current examples of training policy are the current training doctrine in FM 25-100 and 25-101, Warrior XXI for institutional training and the Combined Arms Training Strategy (CATS), and WFXXI governing training in units. Training development is the determination of task, condition, standard embedded in the Soldiers Manuals or the AFV Gunnery Tables. Design of the CTC infrastructure of OC, Opposition Force (OPFOR), AAR and Instrumentation System is also training development. One of the best single examples is the training matrix design that preceded building the UCOFT. Once the training policy is determined and the training development completed, that is, once it has been determined what is to be trained and how it is to be done, the training support should be obtained. Training support is the Range 301 complex in USAREUR, all of the Multi-Purpose Range Complexes (MPRC), TES, and all of the UCOFTS.

There is superb training support available today that tends to be confused by many as representing the state of Army training policy and training development. Much of the training support is the product of training development of the seventies combined with the affluence of the Reagan years, which permitted the product to be bought in the eighties. Now most of this infrastructure is slightly out of date and about to age more rapidly as the Army shifts doctrine, tactics, techniques, and procedures.

Training policy remains as it was for the Cold War. Training development is moribund. Even major current training support investments such as the CCTT reflect the training development of the seventies. CCTT and TES are necessary, useful, and clearly an outstanding launch pad for the new requirements of Force XXI, but neither reflects the training development mandated by Force XXI. Nor could they expect to because the training policies that will govern Force XXI Operations have not been determined.

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22 There have been serious reductions in the numbers of senior officers (majors through colonels) assigned to the schools. Gross numbers cannot tell the story alone. Experienced hands can sense the emptiness on most TRADOC posts today.

There must be an agreed taxonomy for the debate to occur and about which corrective action will be initiated.

The following sections of this paper detail total force training applications, training development shortfalls, and new missions and capabilities.

II. TOTAL FORCE TRAINING APPLICATIONS

A. THE TRAINING SYSTEM IN TRANSITION

Developed according to a consistent vision over 20 years, the Army's training system made a major contribution to agreed tactical success in Desert Storm. European allies clearly skeptical of the merits of the Systems Approach to Training and the accompanying infrastructure in the early eighties were eagerly cloning it in the nineties. But the Army has moved on to new training challenges associated with the end of the Cold War and the advent of the Information Age. It is time for the training system to be renovated in response to the new challenges.

There are several indicators of the need for serious review and change particularly in the area of training development. The training doctrine as expressed in FM 25-100 and 25-101 does not reflect the training challenges associated with emerging Force Projection.[1] The Mission Essential Task List (METL) focus of the General Defense Plan, Capstone Task Organization, and the Battle Book are no longer present to guide training.

Further, the prevailing training doctrine assumes that the desirable and most probable instrument of landpower commitment is the Corps Task Force stabilized to train as a team and composed of balanced representation of combat, CS, and CSS units. The epitome of this vision was VII Corps deployed from USAREUR (U.S. Army, Europe) in Desert Storm. Yet even there, indications of change were present. VII Corps—in fact all of the Desert Storm force—was reinforced to provide the best the Army had. In a notable change to traditional army cadre policy, deploying units were filled with the best individual officer replacements.[2] Individual competence appears to have governed over unit cohesion and integrity. The dominance of quality is an emerging characteristic of the knowledge-

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1 Headquarters, Department of the Army FM 25-100, *Training the Force. Soldiers, Units, and Leaders*, Washington, D.C., November 1988; FM 25-101, *Battle Focused Training. Battalion and Company Soldiers, Leaders, and Units*, September 1990. For the joint equivalent which draws heavily on Army-originated training doctrine, see *OJCS Joint Training Master Plan for the Armed Forces of the United States*, 28 February 1994.

2 Normal cadre policy requires the losing unit to nominate an "A" or "B" slate, not knowing which would be selected, thereby ensuring fair talent distribution. In Desert Storm, sending the "best" individual seemed to dominate policy—SAMS' "Jedi knights" sent to CENTCOM, etc.

based Information Age. However, this was the first major commitment of landpower where quality appears to have influenced, if not governed, individual assignment policy. *Ad hoc* force composition appeared for the first time. It has subsequently characterized every force projection deployment.[3]

After Desert Storm, the balanced combat, CS, and CSS composition of the force disappeared. Forces composed to overwhelm local contingencies were weighted heavily with the battlefield function required to dominate. Hence, the emergence of *ad hoc* functionally based force projection operations that were usually Joint, often with allies or partners in projection selected for national reasons. This is a very different unit training challenge than that of the Cold War. There is insufficient training guidance appropriate to this new training requirement reflected in the current training doctrine.

Nor does current training doctrine address modification of training requirements in the event that quality personnel are no longer available. Either accession quality slips for U.S. forces or the unit finds itself "working with" (that is, training) lower quality personnel in allied units. The same gaps in practical training development apply to situations of very high personnel turbulence or turnover. In the face of these deficiencies, it seems reasonable to assert that current training doctrine needs review if not modification to ensure that units are prepared with training responses to these new and emerging training readiness problems.

Then there is an entire range of training challenges associated with new technologies. Training support and training development have not been tied as new capabilities arise. Lacking a persuasive rationale and timely methodology for determining training requirements, the training aid (support) usually is available before its intended use has been determined.

To be fair, there are some formidable problems in determining requirements. The challenge of determining the appropriate training mix of virtual, constructive, and live simulation has been discussed. Little is known about the effectiveness of small team or unit collective training when it is distributed to trainees at widely separated sites—a new capability enabled by Distributed Interactive Simulation. To date, there has been no practical tie between the Army's two most significant investments in training, that is, TES

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3 But policies have not been modified to ensure that hastily composed units are bonded, and trained, as cohesive teams—a policy change this new commitment pattern would require. This was not a problem in Desert Shield due to the delay time between projection and combat which permitted the necessary training and bonding to occur.

either grouped or distributed, and the CTCs. What should performance in one mean to entry in the other? In other words, competence (level of unit collective training proficiency) gained in virtual simulation at homestation should be reflected in a higher level of entry exercises in live simulation at the NTC or other CTC. Then whatever level of proficiency gained at the CTC should be sustained in TES at homestation. These are practical, easily resolvable challenges of application. There are other more difficult issues.

Very little is known about the training effectiveness and efficiencies possible through immersion in tactical situations enabled by virtual simulation. The training can clearly become more intense as the individual, team, or unit is faced with increasingly difficult tactical situations. And the ability to recreate situations where every object on the battlefield can be consistently precisely relocated on the ground for as many iterations of training as may be required has yet to be reflected in design of training for Army-wide applications.[4]

So training support is well ahead of the training development. Although virtual simulation provides a capability to demonstrate effective, competent unit performance as part of a unit collective training package, this application has yet to occur, and it is almost 10 years after the emergence of virtual simulation (SIMNET). Nor have emerging technologies been used to develop higher resolution staff tasks for use in exercises, either in constructive or virtual simulation. In fact, there has been very little change in the actual conduct of staff training in several decades. The "driver" has changed from manual to automated wargaming but the staff exercise training itself has remained largely unchanged.[5] This lack of training development leaves the Program Manager (PM) developing training support without a specific training objective or approved training program to guide his efforts. As seen currently in CCTT development, the aggressive PM invents his own.[6]

Although these examples relate to amortizing the potential of new, largely digital capabilities, the problem is not new. The Army fielded the M60A3 tank without a training package. It took about 5 years to catch up to the fielding plan with an appropriate Conduct

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4 Use of this capability of virtual simulation has begun with the development of SIMUTA-structured training exercises (Tables and Modules) for the ARNG. The path for unit training is clear; staff training is challenging but coming. Serious work has been underway but more in training support than in training development.

5 Useful innovation has occurred in the conduct of staff training exercises and the use of senior mentors in the Battle Command Training Program (BCTP) portion of the CTC, but these innovations have not come down to brigade or battalion echelon staff training to date.

6 Perhaps a bit of overstatement. As SIMUTA was developed under the guidance of ARI-Knox, support to CCTT was an agreed objective.

of Fire-Trainer (COFT). In general, when there were definable, understood tasks which had to be trained—the product of training development—solid training support has followed. Quantifiable gunnery tasks stimulated a succession of device improvements from sub-caliber devices to simulators such as Weaponeer for individual weapon qualification or the COFT for AFV qualification. Without task definition, the effectiveness of the training support has varied.

So there are substantial problems in the current training system, and until very recently, TRADOC has not been able to address training development, particularly for collective training in units. Much of the problem has been and remains resource-driven. Where the need for training development was understood, resources restricted timely development. Consistent with the primary mission of TRADOC residing in the institutional training base, the school house, resources were focused on that part of the larger training problem.[7]

One result of the atrophy of training development has been the inability to move beyond the use of, in general, broadly defined situational training exercises (STX), to define requirements for collective training. Inability to use new technologies to better define task training requirements for staff and collective training left little alternative for more rigorous definition. Nor does there appear to have been any field unit call to improve the task resolution of exercises. Although generalities in exercise description left considerable flexibility to the unit commander, they fostered a lack of detail in definition of training which effectively precluded measurement of unit training proficiency and comparison of commander performance in training. This was not a problem to broader interests of Army management, as long as the formulation was sufficiently precise to justify resources for training. There were no compelling reasons to constrain commander flexibility by increased requirements definition in an area of obvious importance to overall Army mission readiness.

Now that resources are exceedingly limited, however, the inadequacies of exercise-based Combined Arms Training Strategy (CATS) emerge. At present, there is no necessary tie from exercise performance to attainment of any particular task proficiency.

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7 This was exacerbated when subordinate offices associated with individual and collective training in units (TDI and the Combat Arms Training Board later ATB) were disestablished by TRADOC as economy measures. Relying on a considerable bank of training development (probably over-elaborate in retrospect) from the seventies, leaders sacrificed planning for the future in false economy measures.

Completion of a particular STX ensures nothing unless there is comprehensive analysis of the exercise. This analysis requires considering the following questions:

- Was the STX conducted in a major training area (MTA) or a local training area (LTA)?
- Was an OPFOR provided?
- If so, was it a trained "professional OPFOR" following accepted doctrine?
- Were there trained OCs?
- What tasks did the unit actually perform?

Exercises were an acceptable resource stub entry when resources could permit remedial training if the unit erred. Now that flexibility is disappearing as complexity of doctrine and tactics, techniques and procedures (TTP) increases and resources decrease, task-based, not exercise-based, training needs to occur. More important, task definition, then training of the tasks to condition and standard, is national leverage vis-à-vis other military establishments in the Information Age. Task definition should be exploited.

B. IMPROVING TRAINING EFFICIENCY AND EFFECTIVENESS

Doubling or tripling both effectiveness and efficiency simultaneously is an appropriate ARPA high-risk mission. It mandates an order of magnitude change, which, if successful, will change the active/reserve defense readiness equation in the United States. It is becoming increasingly obvious that active and reserve training environments are converging. Forces in USAREUR are nearly as constrained in training terrain and to a lesser extent, training time, as is a typical National Guard unit.[8]

The early news on accomplishment of the ARPA mission is promising. As the initial products come on line, all appear to agree that improved, very intensive training is occurring. The potential is there clearly for a doubling of effectiveness. But many of the relevant training development factors raised above have not been included. The training is designed for execution at a fixed site with a plentiful training support infrastructure—Fort Knox. It has yet to be modified and proven for distributed execution.

One aspect of improved effectiveness and efficiency which has not been addressed explicitly is the importance of quality personnel to the various training improvements

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8 A recent ARI Paper recognizes "synergisms that provide higher levels of training effectiveness with substantial reductions in cost." Dr. Halim Ozkaptan and LTC David Kendrick, *The Synergism of USAREUR's Total Training System*, April 7, 1995, p. 1.

considered in this research. Quality people are certainly not the only thing, but they are exceedingly important. The presence of quality soldiers during the past decade has permitted major changes in the organization and process of training for both active and reserve forces. An assumption of quality personnel has pervaded all of the research.

Four major thrusts, all of which continue, were proposed in previous research: greater compression, distribution to the user, application of new technologies, and quality management. Compression was facilitated by earlier work done at Fort Knox to create Tank Combat Training with maneuver-based Tactical Tables as an adjunct to Gunnery Tables. Thus proven in the eighties, the vehicle of the table permitted packing more tasks, conditions, and standards into exercises, as well as ability to cause more exercises to occur in a given time period, normally the 4-hour ARNG training assembly. The same structuring of the collective training process permitted more frequent, more focused AARs. Distribution, using the developing "information superhighway," permitted not only movement of the training to the soldier but also through the use of tables in virtual simulation, the export of quality control. With the ability to recreate precisely tactical events comes the ability to assess fairly, since so many conditions of the battlefield can be held constant despite separation of training locales. The technology is seamless, low cost, distributed TES. Visual cueing permits intensifying the training process through creation of multiple, interactive, immersion-based learning situations. Quality control is achieved through uniformity of the AAR process as well as the ability to distribute uniform, structured, individual and collective training vignettes or tables and to give priority to the training requirement. Although the early focus has been pre-mobilization training, active force applications for pre-deployment *ad hoc* and functionally based force projection operations will cause the post-mobilization training development to occur once the pre-mobilization training has gelled.

IDA Paper P-2611, *A Simulation-Based Intensified Training Readiness for the Reserve Component,* completed in December 1991, addressed this hypothesis. In effect, the paper is a broad statement of training policy—with accompanying training development generated with broad knowledge of the training technologies (training support)—which was in the process of creation by ARPA in the Advanced Distributed Simulation Program. It was intended to not only lay out a hypothesis for training development to achieve the ARPA program objective but also to validate the paradigm of blending evolving distributed TES into equally evolving training policy, training development, and training support. It is

intended to be an Information Age model for development of individual and collective training in units as it strives to double or triple the effectiveness and efficiency of training.[9]

The first tangible product of the development model is the Simulation-Based Multi-Echelon Training Program for Armor Units (SIMUTA) completed at Fort Knox in late fall 1994.[10] Designed for execution at Fort Knox in the Reserve Component Virtual Training Program (RCVTP), SIMUTA consists of 96 tables at the platoon, company, and battalion echelons centered on Movement to Contact and Defense in Sector missions in the central Corridor of the NTC.[11] The tables focus solely on the execution phase of the missions. Planning and preparation phases training support for the same missions has been prepared at Fort Benning. User evaluation by both active and Army Guard units has been positive. Based upon this success, the table development effort has moved up to Brigade echelon for the same missions in the central Corridor plus Deliberate Attack. This effort, the Simulation-Based Mounted Brigade Training Program (SIMBART), should be completed in 1995.

The Force XXI Training Program (also known as Virtual Brigade) is a parallel effort, also under Fort Knox, to develop the staff training modules and the structured training (tables) for the other battalions and companies in the Brigade Combat Team—Artillery, Engineer, Air Defense Artillery (ADA), Forward Support Battalion, etc.[12] The larger and more comprehensive effort is Warfighter XXI, an integrated effort under the TRADOC Combined Arms Center. Warfighter XXI addresses five components of training: a SATS, TSP, TADSS, STAARS, and the Library (interactive data).[13]

Implementation of the training policies, training development and training support hypothesized in various papers is clearly underway, largely as institutionalized in the Training Support Packages of Warfighter XXI. It is moving roughly in parallel with development of the training support—seamless, distributed TES.

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9 Subsequent papers, including this one, explain the evolving model which has by now (12/94) been accepted in broad measure by TRADOC-CAC as the Army Training XXI (Warfighter XXI) vision at least for the conduct of collective training in units.

10 Turecek, J.L., C.H. Campbell, W.E. Myers, and T.H. Garth, "Reserve Component Virtual Training Program Orientation Guide," Army Research Institute Research Product 95.07.

11 By subsequent contract, a third mission, Deliberate Attack (DATK), is being added.

12 Tables structure unit training, Modules structure staff, individual, and team training (see IDA Paper P-2611, cited earlier).

13 See Enclosure 1.

The genesis of SIMUTA, expressed in IDA Paper P-2611, is considerably more than a rationale for building tables. Consistent with the attempt to construct a new model for training policy, training development, and training support, the paper articulates a comprehensive vision how all should fit together. It addresses the question, to what end do training policy, training development, and training support contribute? Elements of this vision will be discussed below. They are largely those concerning training development, the focus of this paper; however, training policies and training support, including working the climate of command within the unit, are also addressed. For example, encouraging initiative by the small unit leader reflects evolving thinking concerning battle command.[14] Change is endemic and encouraged when it permits retention of warfighting advantage. Several examples follow of applying training development to collective training in units: exploit immersion in warfighting; create new training exercises; and use Drills and Tables to train basics.

1. Compression of Training

Development of interactive immersion-based training is one of the primary vehicles to achieve compression of training. This may not seem to be training development, but it is as much as is defining tasks, conditions, and standards. In fact, this may the area of highest potential in intensifying training but, regrettably, the area least mature in either research or development. That is unfortunate because once absolute immersion is achieved, behavior cues carefully introduced to the individual or unit in crawl, walk, or run levels of complexity can stimulate very intensive learning.

There are several paths to intensification. The most common, and probably the least expensive, is to stimulate the direct personal involvement of the individual. Create challenge such that the ego of the individual is committed to achieving the objectives of the training. Whether for self-satisfaction or proving oneself to a teammate, the result is the same: the individual really wants to achieve task proficiency. After personal ego commitment is achieved, maintain task difficulty just ahead of the level of individual or unit proficiency with occasional examples of success reinforced by reward (praise). This is the motivational dynamic of "crawl, walk, run." Then, if an element of competition can be achieved—against a common standard or with respect to one's peers, or against a very

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[14] For example, it seems increasingly agreed that preparation of combat-ready commander and staff involves both education of the commander in the art of battle command and the training of the staff officers/teams in the TCS of control.

competent unit (the OPFOR)—intensification can be achieved. The point is that these kinds of stimuli should be built in to training policy and training development. The training support should then be designed to reinforce the desired training.

Good training support can really intensify training particularly if virtual simulation can be employed. All have seen the techniques used by professional sports announcers. John Madden's diagrams and instant replay of NFL games come to mind. That is immediate feedback from a highly respected SME manipulating a digital TV image. Much more is possible when visual virtual simulation (detailed representation of length, width, height plus time) come in. Any combination of battlefield objects can be created and recreated precisely. Imagine walking through a synchronization matrix in all four dimensions. Change the timing, location, or amount of artillery or air support and see the difference in battlefield effects. The relationships of time and space, so difficult to explain, can be portrayed visually, replayed, fast forwarded—whatever trains best. The same capabilities can be applied to the AAR. Very precise detail can be replicated as frequently as required.[15]

Some compression of training achieved by drawing on newly created shared experiences may be possible. As structured virtual training exercises are distributed, common bases of tactical experience can be established across the force—AC/RC, Joint or Combined. If an absolutely common task, condition, standard frame of reference develops across the force (tables/modules executed frequently), that common experiential baseline can be drawn on to rapidly validate common task proficiency. Knowing that there is shared proficiency in collective training of basic tactical missions, pre-deployment training need focus only on that which is new, as determined by the METT-T of the force projection operation. The base tables/modules become the shared baseline experience across the force.

A next step could be creation of immersion TES-based training experiences designed not only to train deploying forces in critical likely tasks but also to create rapid bonding of *ad hoc* groups brought together for the commitment. Demanding warfighting situations which require rapid, coordinated team response can be developed in TES.

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15 These capabilities would seem to offer great potential training support for educating tactical commanders in the art of battle command visualization of the battlefield.

Individuals go in, and teams come out of the experiential training. These are all high-potential areas for innovative collective training development.[16]

A second example of the training development component of a vision is design of new forms of exercises—tables, in the case of SIMUTA. Training development can be directed at compressing training through scrubbing the design of existing training to reduce time requirements. Normal STX lane training can waste a lot of time. A typical platoon lane is executed in a morning or afternoon. The platoon spends an hour or two in troop leading procedures, then executes the mission, participates in an AAR, and the 4 hours is about over. Yet much of the meat of the training is in execution. Troop leading is clearly important but it.can be practiced elsewhere, perhaps before the Training Assembly for an ARNG unit. There are other ways to conduct this training such that the value can be increased through more opportunities to execute the mission with the time held constant or even reduced.

To achieve compression of training—homing in on the most important, productive part of the training—some of the lane training could be designed to occur in virtual simulation. Reduce administrative and troop leading time requirements so several "execute" tables with their associated AARs can be trained during the 4 hours or during a shorter period. Clearly some of the training should be conducted on the ground, but only after the basics have been trained to proficiency.[17] Then the training on the ground (or in virtual simulation) should be adjusted so the METT-T of execution is that of a likely force projection mission. Presumably these exercises could then be related to METT-T of exercises to be fought at a CTC so that the productivity of both CTC and homestation training are increased.

However, the point here is not to argue the merits of compression through creating tables. The issue is the application of training development of unit collective training in order to compress the process of training. Much has been done in this area for on-the-ground (analog) training. The Bold Shift training program created by FORSCOM for the National Guard is an excellent example. It employed TES-live (MILES, OCs, OPFOR). Bold Shift is expensive to conduct but it clearly provides effective training. No virtual or constructive TES was employed. As indicated in the example above, application of these

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16 This team building process seems absolutely applicable for CS and CSS units. It is probably not enough for the stress of dismounted infantry units where leader continuity and chain of command cohesion is essential.

17 This was in fact the thought process behind the design of tables for small unit training in SIMUTA.

new technologies should generate very useful compression, which would increase the effectiveness of the training and reduce the administrative overhead.

Once this training development has been validated with units, the next step is to recast the general training policy which governed the training development in order to relate the development (in this case tables) to practical unit use.[18] Elements of the SIMUTA vision related to training policy. Figure II-1 describes the vision (use Drills and Tables to train Basics) of the training policy and rationale for structured training advocated in another IDA Paper and first incorporated in SIMUTA.[19]

Structured training (lanes) consists of Tables and STX—the variable is METT-T (fixed in tables for training "basics," varying in STX).

Tables accelerate immersion; enable the design of "happenings" to focus on selected MOP and MOE.

Table rigor permits performance-basing and detailed analyses and comparisons which exploit the Systems Approach to Training

Structuring permits the "fine tuning" of training experiences to support task or organization competence training. Intensity and complexity can be carefully controlled.

Tables (and Modules) establish common "combat experiences" across a distributed force and they permit the user to see "how to" perform tasks competently.

All supported by STX designed to stimulate (reward) innovation "what if"

Figure II-1. Drills and Tables Used to Train Basics

Structured unit training consists of both tables and STXs. SIMUTA tables train basic unit missions to set, fixed METT-T (Platoon, Company, and Battalion; Movement to Contact; Defense in Sector, at present; and DATK, coming) in the NTC central corridor. Once proficiency is demonstrated in execution of the basic mission, training moves to execution of STX to likely force projection METL. The tables are designed to support individual and unit immersion in the training. To reinforce important training objectives, the capabilities of TES permit introduction of warfighting cues to mission execution. Since

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18 This is a bit "chicken and egg." Which comes first, training policy, training development or training support? In this example of virtual simulation (SIMNET), there was a broad statement of desired policy which preceded development starting in 1984, then the ARPA success which created the training support. Structured training to exploit the training support lagged by almost 10 years. Now the training policy is being proposed in Warfighter XXI. The better model would have been intended general training policy (why needed), training development (explicit training needed), training support (creation of training aids), then specific training policy for employment in units (incorporation in 25-100/101, CATS, Battalion-Level Training Module (BLTM), SATS).

19 Brown, *Simulation-Based Intensified Training Readiness Strategy*, Parts III and V.

the same exercise (table) can be recreated readily in virtual simulation, demonstrations are prepared which show units executing the missions competently; that is, they show "a way" to accomplish the task. With fixed METT-T, very specific MOP and MOE can be developed that are tied to the METT-T of "a way." For example, use of fire support to achieve effective suppression is a clear fire support field artillery task. Task, condition, and standard are stated in general terms. At present, there is no example which shows the staff or small unit what effective suppression is in the context of a specific mission for purposes of training. With the fixed METT-T "a way," effective suppression can be defined explicitly; that is, "Battery Three at 123456 by time H+33 minutes. Standard is less than H+34 minutes or . . . ." The methodology permits not only highly detailed performance-basing of the training but also opportunities to employ the record of "a way" table execution to support force development or material development.[20] Many of the variables that are normally uncontrolled are fixed in "a way."

Broader application of the use of TES to structure the training combined with the use of tables permits much more detailed design of collective training experiences for rapid bonding of units or pre-mission rehearsals. The intensity of the collective training experience can be controlled. And the training experience (table) can be exported absolutely uniformly to ensure that widely separated units have common basic collective training experiences. Exportation of SIMUTA for exactly these purposes is intended as part of the ARNG brigade training strategy to be developed in support of SIMITAR—an ARPA program extending SIMUTA to brigade echelon. All of this relies on the use of tables. As soon as METT-T are relaxed—modified to the training requirements of various chains of command—innovation can be encouraged in STX. The table or drill does not exclude the STX. Rather it trains and confirms the basic proficiency which must be the launch pad for useful tactical initiative expressed in execution of the STX.

2. Training Precedents

It is of course helpful when there are training precedents—training policies and training support which have been acknowledged already by units. SIMUTA capitalized on unit acceptance of the concept of tables as incorporated in AFV gunnery training.

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[20] Very specific, detailed MOP and MOE can focus data collection for the AAR—easing the AAR data collection challenge greatly. And the detail of known MOP and MOE of "a way" should reduce OC requirements for exported collective training. The more the training (of the basics) is structured, the easier to provide Tips for the Trainer for chain of command use in AARs and thereby reduce the reliance on OCs.

The plan for adaptation of gunnery tables for small units was straightforward. The original formulation for Tank Combat Tables was prescription of a series of Gunnery Tables (I through XII) complemented by a series of Tactical Tables (A through I). The gunnery tables, combined with an individual skills pretest [Tank Crewman Gunnery Skills Test (TCGST)], had been in use since WWII. Unfortunately, the traditional gunnery tables (live fire with service ammunition and therefore constrained by terrain and safety) did not train to all of the tasks required to exploit the new capabilities associated with fielding of the Abrams/Bradley AFV team. There were no 360-degree engagements, although those tasks seemed certain to be required in future battle. So highly detailed Tactical Tables were specified from individual AFV level to Platoon level to develop proficiency in those tasks which could not be trained safely in gunnery. Originally, the tables were to be fought using MILES (Live TES); subsequently, SIMNET (Virtual TES) was seen as alternative training support.[21]

The Tactical Tables were a modest success at best. New to all concerned, they were not made mandatory for readiness accounting as were the Gunnery Tables. All the rewards remained with traditional gunnery. The Tactical Tables were not upgraded as requirements changed; despite being the original motivation for developing SIMNET, SIMNET training was not structured for Tactical Tables. However, the necessity of conducting tactical training complementary to gunnery training on weapons was agreed upon.

Now, new training support (CCTT) and training development (structuring of training—"a way," etc.) make the concept of tactical tables both feasible and desirable as a means to intensify the training process, particularly for development of basic collective proficiency in the small unit. So platoon, company, and battalion tables have been prepared for SIMUTA as a proof of principle. Initial results have been sufficiently promising to extend the training development to brigade echelon, including the various combat support and combat service support units in the Brigade Combat Team (Artillery Battalion, Engineer Battalion, Forward Support Battalion, ADA Battery, etc.).[22] Now the intent is to extend the table training concept to staff training.

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21 In fact, one of the original reasons for development of SIMNET was the high OPTEMPO (operations tempo) operating cost of conducting the Tables using MILES. Live ammunition was conserved but execution of the Tactical Tables consumed fuel and spare parts. Some less expensive way to train these 360-degree tasks had to be found.

22 SIMBART as the brigade extension of SIMUTA and Virtual Brigade (i.e., Force XXI Training Program.

Early in the training development of intensified collective training in units, it became obvious that something more was required than statement of task, condition, standard in the training of new complex battlefield tasks and particularly the various synchronization tasks. To develop very detailed demonstrations of how to execute individual or collective tasks, particularly in units, there had to be some way to exploit the visual 3D strengths of virtual simulation with the rigor of execution of a gunnery table. This seemed necessary as task complexity and the tempo of likely execution increased in AirLand Battle (ALB), with every prospect that there would be even greater increases in Force XXI Operations.

The answer was proposal of developing "a way" to train basic tasks, as discussed above. The concept is presentation to the individual, team, or unit in training of a detailed record (videotape, at present) of how a competent individual, team, or unit accomplished the same tasks being trained to absolutely identical METT-T. Again, the working assumption is that the mere statement of task, condition, and standard is insufficient for effective training. The individual, team, or unit needs also to observe performance, at least for the most basic integrating tasks such as Joint Air Attack (JAAT), Joint Suppression of Enemy Air Defense (JSEAD), Counterfire, or breach of a major barrier. Such a strategy was infeasible before distributed TES, which permits capture and precise replay of combat actions.

The next step was to tie "a way" or demonstrated competent performance to actual performance of the same table by the individual, staff, or unit in training. For example, assume that execution of a mission in a table starts at 0900 and terminates at 1000. "A way" is the TES record (virtual or constructive) of execution by a competent individual, team, or unit. "Your way" is how you, the individual, team, or unit in training actually perform the mission to the identical METT-T. Then, the AAR becomes a comparison of how the competent individuals, teams, or units in training actually performed compared to "a way."

Once the value of a demonstration was realized, the next step was to look closely at what could be included in the demonstration. Once METT-T are "frozen" for purposes of creating "a way," very detailed MOP and MOE become possible. Explicit performance

measures tied directly to the "a way" scenario became possible at least for the basic tasks reflected in the demonstration.[23]

For the first time, very detailed comparative data could be made available for AAR purposes. And since AAR preparation increasingly focused on comparison of the detailed MOP/MOE "a way" to "your way," the problem of AAR design was simplified considerably. The MOP/MOE of "a way" are known before the individual, team, or unit undertakes "your way." AAR preparation becomes largely an issue of comparison of "your way" MOP/MOE to "a way" as indicated—a much easier data collection problem. And even more important, easing of the complexity not only reduces the requirement for OC intervention but is clearly necessary for export of this form of structured training to units.[24]

Once "a way" is available in a media that can be exported (videocassette and CD ROM soon), new opportunities arise to intensify the training process. At least six steps can be developed to take maximum advantage of this training opportunity:

1. Orient the individuals, teams, or units to the scenario to be trained; that is, brief them on the Planning and Preparation that preceded the Execution included in the table.[25]

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23 There are predictable differences as to the merits of this methodology. In reviewing this paper, Dr. Barbara Black commented:

> Paper . . . could acknowledge the basic human learning principles of demonstration and practice. Then "a way" is easily understood in the context of "a demonstration" of how the task could be performed if the task is "observable," e.g., platoon maneuver task. However, demonstration becomes much more problematic when the task is not readily observable such as when staff members are completing cognitive tasks. Vicarious learning and modeling are well documented human learning techniques and applicable to specific types of tasks. However, I believe the issue raised for the Army as a whole is really the opportunity to practice and more specifically to practice in a structured environment with competent feedback. The immersion in the execution environment that is supported efficiently and effectively by TES is where the value added resides.

I agree that the central issue is determination of the "best" means to stimulate, to intensify the immersion experience. In this sense, demonstration may be a poor choice of words for it causes expectations of conventional representation such as that expected for platoon maneuver. That is not intended. Observation of a JANUS screen accompanied by a list of actions taken by a competent staff officer may be all that is required for staff training. We don't know and need to find out.

24 This easing does not apply for STXs at least at this stage of training development. Tables apply only to the training of individuals, teams, or units to very basic tasks. METT-T is "unfrozen" for the STX in order to permit design of the training exercise to force projection METL. There is no "a way" possible once this is done. That may be feasible in the future but I doubt that it will be desirable. "A way" seems appropriate only for training the basics.

25 This material has in fact been prepared by ARI for the battalion echelon staff planning and preparation associated with the SIMUTA missions and is currently available on CD-ROM as the Battle Staff Training System.

2. Bring the individuals, teams, and units to the moment of initiation of the tables. For example, if LD is at 0900, explain what happened immediately prior to 0900. The context of both enemy and friendly actions needs to be established so that there is seamless transition into execution in simulation.

3. Execute the table for whatever period of time has been incorporated in the table. For the platoon or company this involves fighting "your way" to a level of competence comparable to the "a way" another similar unit performed.

4. Receive an AAR in which you discuss in detail how you performed in comparison to the unit demonstrating competence in "a way." The AAR would bring out areas for possible improvement. Then, having taken corrective action, execute the table again until you get it right or you and your chain of command are confident that you can move on to the more important STX.

5. Based on "your way" performance, execute "what then" or "what if" extensions of the tables. What if the enemy had done this or if you had not done that? As the METT-T vary (tables become STX), the chain of command should restructure the METT-T to create the METT-T of likely force projection operations so the individual, team, or unit is not left at the "a way" level of proficiency necessary for mastering the basics but insufficient for mission commitment.

6. Follow up the intense training experience with training support material for the individual, staff, or unit to continue to train on deficiencies in table/STX execution. Using the AAR, the record of "your way" execution and the AAR could be made available for further training.

These seem to be the six basic steps for this form of structured training. More can certainly be developed by innovative trainers. Further, it would seem that the steps described for application in virtual and constructive simulation could be applied to training using live simulation or "analog" training, otherwise known as lane training. In consideration of the high investment costs associated with this structured training, a better return on the training support investment should clearly be sought.

Proper design of the flow of training should create some really dramatic increases in effectiveness and efficiency of training. While 50 percent of the training benefit coming both before and after the actual training experience may seem ambitious, consider what the structured methodology plus virtual or constructive simulation provide. "A way" is known in advance both to training developers and to those who will train. An AAR can be prepared of "a way." As an individual, team, or unit coming to execute "your way," there is powerful incentive to study "a way" in advance.

The same motivation applies for the planning and preparation undertaken prior to execution. That material, developed to identical METT-T, is available on CD ROM. Solid leader training seems possible before the table training begins, as leaders draw on this material to enhance table performance—and develop command and staff task proficiency in these missions.[26]

Similar logic applies after the training occurs. The immersion training experience can be prolonged by providing take-home (on videocassette or CD ROM) coverage of the "your way" AAR as well as the record of the "what if" and "what then" training. The intent is to extend the training benefit by providing training support material that can be used after the training has been completed. If the immersion characteristic of the virtual simulation is fully used, the "mind's eye" of the individual, team, or unit should be able to draw out even more discussion of what might have been. This too can be very effective training.

There would appear to be considerable operational application of this type of training. While the original focus was RC training, it would seem applicable for marshaling area training when personnel in the unit have been brought together (filled) for deployment. Both intense task retraining and useful team bonding training can occur. The same rationale could apply also to pre-CTC training. The common tables, particularly those applicable for individuals and teams, are by definition amenable to distributed execution. This would seem particularly useful for Joint and combined training.

One of the hallmarks of solid training development is the ability of the product to respond to the unique training requirements of the various chains of command. Just as Force XXI Operations require great adaptability in unit performance, so there should be parallel adaptability of the training support provided to the unit. At a minimum, structured training should be flexible in echelon being trained, in the nature of training support required to cause the training to occur, and in the manner of application. For application at battalion and below, the range of training support should be from AFV or infantry fire team to battalion.[27] Locales supported should range from CTC to regional MTA to LTA and homestation or local armory, with expansion to individual home or worksite for distributed training. The means available should extend across the range of TES; that is, seamlessly prsent a mix and match of virtual, constructive, and live simulation so that the unit can shift from one simulation to another, depending on local needs, without loss of the continuity of

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26 There would seem certain to be useful applications of this in institutional training.

27 Future technologies should bring the training to individual soldier level for selected tasks.

the mission being trained. This flexibility will be limited due to the difficulty of ensuring absolute verisimilitude of training cues when either constructive or live simulation is employed. For example, weather variations can cause wide differences in the conditions for firing major gunnery ranges such as Range 301 in Germany. Tables conducted in any simulation form other than virtual simulation can vary greatly. Lastly, the training should support a logical flow from preparation to conduct to remedial training, and, as discussed above, it should be feasible as both centralized and distributed.

C. TRAINING POLICY

To this point, discussion of training applications has addressed issues of training development—largely actions that could be taken to increase the effectiveness and efficiency of training. Training support has been considered in the context of execution of a training requirement created by previous training development. There is a third element which will often dominate actual application: the training policy that governs application in institution and unit. The major training policy documents for the Army are FM 25-100 and 25-101. These prescribe the overarching training system and policies that will govern applications. Although they are grounded in training development of the seventies and eighties, they remain relevant, if perhaps outdated in parts. New capabilities and potential strategies require new policies. Several examples of training policies appropriate to new training requirements and capabilities follow.

Execution of a combination of tables and STX is one of the postulated requirements of structured training drawing on TES. The issue is to determine how much of each and for what purposes. Each alone is insufficient. Some are concerned that excessive reliance on table execution will result in an Army able only to ape others and unable to handle the confusion of actual combat. At the other pole is the STX-based training criticized effectively by the GAO for having insufficient rigor of task definition.

The policy response must be both table and STX. Tables are required to demonstrate explicit specific proficiency to standard. Presumably, task proficiency will be required to be shown at some defined interval and retrained when certain personnel turbulence or turnover occurs. For a very stable unit (a high priority AC unit) tables would occur infrequently—perhaps 5–10 percent of the collective training time. At the other end, a unit with very high turnover could be conducting tables during 50 to 60 percent of its unit collective training time. In both cases the table training would be followed by STX training in core missions defined by the chain of command. While these should be Force Projection

METL-based, there would still be pre-deployment training required to the precise METL of the actual theater of operations.[28]

Within the broad guidance of the policy discussed, chains of command would have to determine how much of which (table or STX) would be required and then allocate resources accordingly.[29] Tables should be relatively easy to quantify for resources due to the predictability inherent in design. STX would be more difficult due to local variations in opportunity for training in live TES on terrain. These are important training policy issues.

Training policy also determines how the product of good training development and training support actually meet in support of unit training. For example, consider "crawl, walk, run"—a policy of conducting the training in a sequence of increasingly challenging conditions. Determining how the policy should apply to structured training involving tables and STX as training requirements evolve is a genuine training issue, one that will have important impact on the design of fielded structured training.

A third type of policy issue is exemplified in the recent ARI study of battle staff training in six battalions at the JRTC.[30] Here, a training requirement is created as a delayed result of past decisions: severe reduction of battalion staff training in institutional training, decreasing time in units in the various staff positions by the coming cohort of battalion commanders, and high turnover of staff officers. These problems are exacerbated by the Army's inability to date to complete the structuring of training as was done for NCOs. Structured training of the TCS of control has not yet been introduced for the officer corps. Battalion staff officers and staff teams are basically trained on the job. Poor, incomplete, or inconsistent policy has created a serious current training problem—the inadequate Battle Command Staff Training (BCST) revealed in the ARI study.

Actually the problem may be even more challenging. In the case of BCST, poor policy has combined with absence of training development and fragmentary training support to create a major training challenge just as the Army starts into the Information

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28 These examples relate to small unit training. Different ratios would be appropriate for command and staff training at battalion or brigade. And the trainer must distinguish between requirements to train the TCS of control from education of commanders in the art of command. Command and staff training is a different problem.

29 There would seem to be application of Tables to pre-mobilization training for RC as well as to BLTM and OPRED assessments, but that is beyond the scope of this discussion.

30 Thompson, T.J., G.D. Thompson, R.J. Pleban, and P.J. Valentine, "Battle Staff Training and Synchronization in Light Infantry Battalions and Task Forces," Army Research Institute Research Report 1607, December 1991.

Age.[31] After all, the distinguishing characteristic of the Information Age is knowledge—timely information passed horizontally by echelon and vertically by BOS. Exploitation of this information mandates highly trained commanders and staffs—individuals and teams who not only know the tactical, technical basics of their position but also know how to apply this expertise themselves and with their teams (staffs) in the accelerated tempo and confusion of warfighting. In the Information Age, untrained commanders and staffs incapable of focusing combat assets in time and space may be a relatively greater obstacle to success than untrained platoons and companies were in the Industrial Age.

This may be a major problem for several reasons:

- First, the Army today has neither a conceptual approach nor a practical system to train commanders and staffs actually serving in units.
- Second, there is no agreed upon conceptual approach for the development of training to exploit functionally based combat multipliers.
- Third, there is no comprehensive model of staff training which could focus the training development and training support that are lacking.

First, the current approach to staff training, developed by TRADOC, serves TRADOC school house responsibilities, not those of the ultimate "customer," the field commands. Staff training within the institution trains individuals grouped into homogeneous groups. What staff training there is, and there is very little at battalion or brigade echelon, is provided by the Officer Advance Course to young officers preparing to be Company/Battery/Troop Commanders, not staff officers. Combined Arms and Services Staff School (CAS3), an excellent course, trains logical thought processes in the context of generic staff actions; it does not train staff officer battalion/brigade warfighting responsibilities, i.e., the Bn S3 in the MTC.[32] C&CSC trains staff officers but the focus is Division and above. So the content of TRADOC staff officer preparation is inadequate.

Even worse, by training in homogeneous groups and then exporting training designed for homogenous groups to very dissimilar groups—the typical unit staff—the TRADOC instruction may be absolutely dysfunctional. Young captains have not been formally trained in their jobs as staff officers in combat and have not been shown how to train their subordinates (the lieutenants). Nor have they been trained in the responsibilities

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31 For a personal assessment of this problem, see Enclosure 3. Note that the focus is training in TCS of control not education in the art of battle command.

32 CAS3 does train logical thought and organization, essential to compensate for the deterioration of college curricula.

of their peers or of the staff majors. The average unit staff is composed of officers of widely differing experiences. Training a group like that is challenging under any circumstances. Doing it without explicit training material is very difficult.[33]

To be sure, there are numerous, expensive simulations designed to support staff training exercises. But they assume that the user knows in detail what is to be trained. As pointed out by the GAO, execution of exercises mandated by the CATS does not necessarily create effective training. What specific tasks are trained to what standard? There are no detailed specific mission-oriented staff tasks today. Assuming that there were proven staff training packages prepared by TRADOC for unit staff training, they would probably be increasingly out of date. Force Projection today does not require Cold War-Desert Storm balanced Task Forces. It is *ad hoc* and functionally based, usually Joint and often combined. The good news is that there is a clean slate for developing new TES-based staff training. The bad news is that TRADOC has neglected a fundamental responsibility to support effective staff training in units. There is neither a conceptual approach nor a practical system to train battalion and brigade unit staffs today.[34]

Second, there is no agreed conceptual approach for the development of training to exploit functionally based combat multipliers. Unit training is a combination of training by echelon (horizontal) and training by function (vertical). There is very little if any multi-echelon vertical training today, largely because there is no accepted conceptualization of the training requirement which causes vertical training to occur. For example, IEW is absolutely vertical. The collection and jamming assets in the maneuver battalion area may be working for the collection manager at Corps. With ASAS, the Support Company Commander serving the Brigade S2 is a member of an intelligence team that extends vertically to national assets "broadcasting" in his or her support. The Brigade Combat Observer/Lasing Team (COLT) moving in the Company sector is a skip-echelon (Bde to Co) Fire Support asset; he is part of a vertical Fire Support team as is the Corps MLRS Battalion Fire Support Coordinator (FSCOORD) supporting suppress and obscure in a brigade deliberate breach. So is the Echelons Above Division (EAD) Maintenance element in the FLE forward of the Brigade Support Area a member of a vertical CSS team. In each of these cases, there is a vertical functional team which should train as a team.

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33 It was dismaying to observe Leader Training Program classroom instruction of brigade and battalion staffs using the C&CSC Study Text 101-5, by definition prepared for instructing staff processes at Division and above. The lieutenants in the back row (the S1, Asst S4., etc.) were absolutely lost.

34 Note that the focus of concern is rigorous training of staff officers in the TCS of control. TRADOC is doing excellent conceptual and practical work in defining then educating the force in battle command.

Identification and training of these teams would seem to be necessary with the increased tempo and coordination required in Force XXI Operations. It is certainly required to prepare function-based Force Projection forces. Patriot was an ADA deployment to Israel in Desert Shield. CSS deployed to Somalia. Engineers and Medics seem certain to deploy to a Chernobyl-type disaster.

Without a conceptual approach, it is exceedingly difficult to even identify the training requirement (TCS), much less prepare the actual training. The NTC developed a superb vertical Fire Support AAR, accepted as useful and necessary by both OCs and the unit in training.[35] It took a series of discussions extending over three rotations to break the mindset of horizontal coordination and cause practical Artillery officers to think vertically as well as horizontally.

Third, there is no comprehensive model of staff training which could focus the training development and training support that are lacking. Without an agreed framework, it is exceedingly difficult to orchestrate training policy, training development, and training support much less secure resources in a very competitive environment. "A way" is sketched out in Figure II-2.[36] The major point is that there needs to be a plan not only to train staff officers and staff teams to specific task performance but also to develop a high-performance organization described in the figure as Battle Staff Effectiveness. This latter component may now be superseded by the excellent Army effort to educate commanders in the art of battle command. But the point is that staff training is too important to tactical competence to leave it to chance and the sentiments of the senior officer present as it is frequently today. The rigor applied to most areas of Army training has just not been directed at command and staff training at the battalion and brigade echelons.

This is "a way," certainly not the only way. The real issue is the need for a model that will focus and justify the training effort necessary. This seems particularly important as Joint and combined forces are composed for force projection and as *ad hoc* units and staffs proliferate. The structure of tables has been validated at platoon and increasingly at company. Young mounted force leaders understand and accept the concept of both individual (staff officer) and crew (staff team) training using this methodology. Staff tables

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35 NTC Fire Support AAR, VHS TV tape, 21 April 1994.

36 Another model which addresses both commander and staff officer training could consist of Battle Command, Staff Task Proficiency, and Battle Staff Effectiveness.

"A Model" is: BCST = Staff Task Proficiency + Battle Staff Effectiveness*

Staff Task Proficiency
- Individual tactical/technical competence (S1, S2, S3, S4, FSO)
- Small staff team tactical/technical competence (vertical and horizontal)

Battle Staff Effectiveness
- Organizational competence (sensing, communicating information, decision making, stabilizing, communicating implementation, coping actions, feedback)
- Battle Staff Integration

* Formulated by Joseph Olmstead, "Battle Staff Integration," Institute for Defense Analyses, IDA Paper P-2560, February 1992.

Figure II-2. Developing a Conceptual Model for Battle Staff Training

(modules) are an understood, tangible objective for resource allocation. Whether or not they endure, they are a practical way to introduce both the problem of staff officer competence and a potential solution to the attention of the officer corps. Some resolution in this area is essential before the tidal wave of increased information flow from digitization reaches and overwhelms small unit staffs.

A model is necessary but it is not sufficient to establish a training program, however hypothetical. As discussed above with respect to structured small unit training, an expression of the overall vision for eventual conduct of the training is necessary. One vision was described in IDA Paper P-2785, *Battle Command Staff Training*, in December 1992. It is consistent with and expands that which had been provided for platoon and company training the preceding year.

The vision extends not only the table methodology but also the logic of "a way" and "your way" developed for small unit training to staff training.[37] The insight that the complexity of the current battlefield is such that training requires both task, condition, and standard and a demonstration of execution by a competent staff officer or staff team seems even more applicable for BCST. Current staff tasks, conditions, and standards are too generic for the neophyte to gain much useful guidance. The fire support statement, "Smoke planned to obscure enemy operation, screen friendly movement, support breaching operations, and assist disengagements . . . " (Task 7-1-29081, p. 5-119, MTP 71-2), is

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37 This conceptual model for battle staff training addresses the training of the unit staff on the tasks, conditions, and standards of control. It does not address other equally important elements such as the education of commanders in the art of command. That is addressed in another program: Battle Command.

good but so general as to be practically worthless other than as a statement of intent. Contrast that with the detail available once the general task is tied to the specific METT-T of a unit table or staff module. For example: "Module for Bn S2, S3 FSO staff team requires obscuring smoke on Hill 781 within 2 min 15 sec of support force arrival at 123456. Standard 2 min to 2 min 30 sec . . ." or whether, if environmental conditions argue against a tactic relying on smoke, the command is prodded to revise its game plan. In this case, denying smoke illustrates the addition of expert level variation of conditions to the basic "a way" model.

Demonstration in detail, a technique applied in the training of soldiers, simply has not yet been applied to staff training. Of course the distinction between staff module ("frozen" METT-T) and STX (METT-T variable to Force Projection METL) is even more important for staff training than it is for small unit training. Once the basics are trained, training must move to the varying requirements of actual combat. But the discipline and rigor associated with demonstrated competence in the staff modules seem absolutely necessary within a unit before it can exploit the opportunities of digitization.[38]

The entire vision is comparable to that proposed for small unit training. There is a model, an agreed methodology for defining, then training, battle staff tasks. Tasks are not only defined but also demonstrated and applied to a specific tactical situation, so that both process and performance can be trained and evaluated. By relying on virtual simulation, the staff in training can be immersed in an intense TCS training environment as they execute "your way." The rigor of the module can be distributed to many staff training iterations with very high verisimilitude from one training experience to another. This permits new opportunities for consistent, fair evaluation of staff individual or staff team proficiency, at least in execution of the METT-T embedded in the modules. This combination presages a solid baseline BCST strategy—"a way" for the Army to assess in building structured command and staff training.

There are many more challenges that need to be addressed to modernize the training system and training development. Baseline tasks need to be established for emerging Force XXI Operations. This is necessary to train the units that will develop the new doctrine, organizations, and material, particularly the information systems. The product will have to be merged into the Combined Arms Training Strategy, governed by a sensible,

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38 This logic may or may not apply to preparation of commanders in the art of battle command. It seems certain that they must have mastered the TCS of control in earlier service as unit staff officers. As commanders, they must visualize the battlefield and conceptualize their intent—a different problem.

supportive training management system (SATS), and then tied to an effective system to generate resources necessary for training [Battalion Level Training Model (BLTM)]. Once the necessary training development is determined, the capability to conduct the work will have to be trained, then institutionalized. Lastly, all must be oriented to the variety of likely Force Projection missions including OOTW. The technology must be shaped to channel individual, team, leader, and unit proficiency across likely missions, from institution to unit and from Total Force through joint and combined task organizations. That is the role of Warfighter XXI—a long overdue focusing of Army training in units.

III. TRAINING DEVELOPMENT SHORTFALLS

A. STRATEGIES AND PROBLEMS

There is an absence of a general strategy to justify requirements for training to be included in a maneuver unit training program in both simulation and live fire. The current rationale mandates a zero sum resource tradeoff. In other words, to many, including commanders, purchase and use in a training program of one more simulator equals one less round of live ammunition for training. Absent any training development leading to a convincing rationale that both live fire and TADSS are needed for different yet complementary purposes, the actual policy is zero sum. Since the benefits of live fire are known, have worked in combat, and are part of the unit culture (the gunnery "pools"), most commanders resist any simulation that may threaten live fire.

Described below is one way to conceptualize use of both simulation and live fire in a unit training program which could be validated by aggressive training development. This model assumes that delineation between TES and live fire is based upon the level of training being conducted. In this example, training in the basics would be in simulation from individual rifleman to platoon echelon.[1] Once basic proficiency is demonstrated, live fire training should be conducted in a combined arms setting with conditions as close as possible to those expected in combat. For mounted close combat maneuver units, this equates to conduct of a Combined Arms Live Fire Exercise (CALFEX). In other words, use live fire to confirm proficiency in complex, quasi-combat settings after simulation has been employed to develop basic weapons proficiency.

Then, use simulation to conduct the really tough training that is too expensive, too dangerous, or too ecologically unsound to execute in live fire: 360-degree engagements involving both close [rocket-propelled grenade (RPG)] and distant (4,000-m) AFV threats on unit boundaries with serious problems of potential fratricide, the confusion of both enemy and friendly attack helicopters and fixed wing aircraft engaging ground targets—the

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[1] Clearly assuming that effective TES exists to train to task proficiency up to platoon level.

Ph.D. level combat tasks not trained today. That training can be accomplished only in TES.

That is one way to delineate training that can only be conducted in simulation. Notice that the overall training requirement is based on the totality of individual and collective tasks likely to be encountered in actual combat, *not* just on those that can be trained safely. The current task list for both Abrams and Bradley AFV qualification is based only on those tasks that can be trained safely. Further, all combat tasks are currently grounded in analysis of actions observable in peacetime—where the front end analysis of the Systems Approach to Training can occur. Thus, rather than approach training at Range 301 at Grafenwoehr as the best available considering peacetime regulations but a poor representation of combat, experiences on Range 301 become the epitome of peacetime training. Simulation then is designed to replicate the known, albeit poor representation of combat (Range 301), not the tasks, conditions, standards actually expected in Airland Battle, now Force XXI Operations.

That is an example of exceedingly poor training development. It is a logical outcome of poor training policy, which encourages training to tasks that can be trained safely in live fire, not to all the tasks expected in combat. Moreover, it steadily reinforces command compulsion to fire live ammunition. Finally, it is poor use of training support in that the matrices in the COFT were re-scaled to train for range-constrained live fire gunnery tables. In sum, AFV gunnery was brought to the lowest common denominator of range availability.[2]

With a training readiness formulation based on tasks trained in both TES and live fire, both justification of training resources and potentially the future assessment of training readiness could become based on task performance to standard in both live fire and TES. Training development is required to determine what the proficiency-level tasks, conditions, and standards should be for each, then to determine how best to achieve and sustain these levels. When the training emphasis is shared between live fire and TES, neither threatens the other because both forms of training support are clearly required. This would seem to be a much better way to assess readiness and justify resources than that used at present. However, that formulation is another problem. The current vehicle, the BLTM, suffers from its own training development deficiencies.

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2 Which was addressed seriously by building tough Multi-Purpose Range Complexes (MPRC)—better ranges but still constrained by peacetime costs, safety and ecology.

The BLTM is noted as much from what it excludes in justifying training requirements as what it includes. The intent—to justify the resources required to conduct training in units—is excellent. Days of various types of training (exercises) are described with specific funding requirements (fuel, ammunition, spares) associated with each exercise for the various type battalions—tank, mech, artillery, etc. Various levels of exercise execution are generally associated with training readiness determination reflecting the state of the art in the early eighties when the BLTM was designed.

This is a useful, necessary effort which is in the process of revision today to align requirements with emerging doctrine, tactics, techniques, and procedures and new forms of training support. Problems arise, however, in application of the BLTM to many units because comprehensive training development for establishing requirements associated with the current training requirements is lacking. The following have not been included as factors in the determination of unit training resource requirements:

- *Turbulence and turnover of personnel.* Every time a new individual enters a unit and simultaneously a subordinate team within the unit, there is a requirement to validate both individual and small team or collective task proficiency. Whether that soldier is newly assigned to the unit, having been reassigned from another unit or is reassigned (promoted, etc.) within the unit, a training requirement is generated. For example, a new tank gunner must be proficient as a gunner and as a member of the tank crew. Every time the company commander changes, there is training which should occur between that commander and his fire support officer (FSO) to ensure that they are proficient in employing fire support. When a new S3 is assigned, not only should his individual task proficiency be verified but also that S3 should train together with the S2 and the FSO to perform tasks involving the proper synchronization of direct and indirect fires in executing basic missions such as Movement To Contact or Defense in Sector. In the case of the AFV crewman, the tasks are defined and there is a frequency of training prescribed in the BLTM which assumes that there is about 25 percent constant turbulence and turnover per quarter.[3] For the Commander and FIST or the S3, there is currently no training requirement documented, nor are there defined specific tasks to be trained. Presumably, both of these officer tasks will be trained in the course of staff exercises, but there is no documented requirement or method to ensure that whatever the requirement is, it has been trained.

  The issue is the extent to which the BLTM considers the training requirements and the training resources associated with variations in either turbulence or

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3 Discussion Mike Kelley, USAARMC, 10/94.

turnover. Unfortunately, there are no factors reflecting requirements associated with bulk percentage personnel turnover much less any requirement whatsoever associated with turnover of key personnel such as commanders or key senior staff personnel.

- *Quality of personnel.* The army today is blessed with very high quality personnel, a far cry from the seventies when the level of proficiency of the average air defense artillery man was so low and the complexity of using the shoulder-fired air defense weapon, the Redeye, was so great that many soldiers could not remember how to use the weapon long enough to graduate from initial entry training. Considerable excellent research has been done to establish that highly intelligent soldiers are required to operate current equipment such as Abrams and Bradley to standard.

  It is hoped that quality soldiers will continue to serve in both AC and RC. The current BLTM takes no account of the Armed Forces Qualification Test (AFQT) of soldiers in determining frequency of repetition of training events required to train and sustain proficiency. Quality (capability) of personnel is invisible in determining unit training resource requirements.

- *Acceptance of time as an important training resource.* Time demands increase on leaders as all echelons increase. Whether the requirement be more time required to master complex officer tasks associated with the increasing complexity and tempo of current warfighting or leader time required to address legitimate requirements of the "Army family," such as the adequacy of family member services, requirements increase. Time is probably the most important resource to the RC. Time to train leaders on the complexities of digitization (horizontal integration/appliqués) is about to increase significantly. FBCB2 is about to place major time demands on commanders because practically every leader from platoon to brigade works directly with a computer screen. Personal proficiency (mastery) is essential. Time, particularly leader time, is not a factor in BLTM resource calculations. However, the issue of time availability is forced to the forefront by the methodology devised by ARI to revise the BLTM. The ARI effort first expands the BLTM as a comprehensive CATS—then it exemplifies this strategy in a complete example 2-year unit training schedule.

- *Acknowledgment of new doctrine.* The current BLTM assumes that Cold War deployments will continue. *Ad hoc* Force Projection presages units composed enroute to marshaling often with Joint and combined forces. Training required to prepare for these operations to METT-T, which are by definition uncertain until the moment of deployment, is not an acknowledged requirement in the BLTM.

The sum of these omissions is a resource generation system that does not reflect the actual requirements placed on today's units. Borrowed military manpower is unaccountable. Even if it were—if there were suitable documentation—unit training is not described with sufficient detail and rigor to be able to put a training cost on this known detractor to unit readiness. Some of the difficulty is training policy that has not been updated consistent with new requirements. However, the larger failing is the absence of the training development that would provide the factors, the explicit costs of detractors, which are a precondition to establishing credible training resource generation.

Few Army training events seem as solidly based as the AFV gunnery tables, particularly the Abrams tables. Today's tables are generally agreed to be a highly successful example of training development. They (and superb soldiers and equipment) clearly demonstrated required proficiency on Desert Storm. The Tank Combat Tables consisting of Gunnery and Tactical Tables were developed in 1984. They were the product of two converging battlefield requirements: the fielding of the Abrams tank—a clear leap-ahead in technology—and concern about emerging new Warsaw Pact equipment. The existent gunnery tables had to be changed to cause the force to be properly trained on the major new capabilities, particularly day/night fire-on-the-move capability combined with exceptional new mobility. Sixty-four tasks were identified as requiring training (with implicit recognition that the tasks had to be trainable on existing or likely ranges).[4] From the 64, 16 were selected for qualification firing. They were generally mixes of multiple, simultaneous targets.

To determine detailed standards, an Abrams force was wargamed against a Warsaw Pact force with modern equipment. Opening times and hit requirements were based on assumptions as to how unfavorable a force ratio might be and the required number of kills to defeat the force with acceptable friendly losses. While this may appear quasi-scientific, creative gaming created the desired outcomes. Although the tables were to be considerably harder so that the armored force would be trained to the new capabilities of the Abrams, the development process was in fact very subjective. It would be exceedingly difficult to produce detailed training development justification for any single task resulting from this process. But the intuition that it was the time for change (increasing difficulty) was clearly on target.

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4 Tasks not suitable for range live fire were placed in tactical tables to be trained using MILES (live simulation).

Significant events have occurred since these subjective tables were developed. Training support designed to the production capabilities of the Abrams has proliferated and been accepted by the mounted force. The COFT, PGT, and now SIMNET-CCTT are available to train part of the training assumed to be required in live fire when the tables were designed. After all, there were few satisfactory alternatives.[5] The Army has now had the benefit of the Desert Storm experience. Perhaps most important, with the end of the Cold War, the apparently highly capable Soviet threat is gone. Given these substantial changes, the odds are increasingly slim that the current AFV gunnery tables are in fact still necessary and valid—slim that the tasks, conditions, and standards remain the same and even slimmer that crew and small unit proficiency is still best trained by current gunnery tables I to XII.

The state of the training "art" has moved on. The technical capability emerges to mix live fire and live simulation (MILES or successors). Training machines (UCOFT) can clearly train some of these tasks; CCTT will be able to train more as a precision gunnery trainer. In fact, CCTT will be able to train tasks far more challenging than those which cannot be trained in live fire due to safety, cost, or ecology concerns. Given these capabilities, why can there not be quarterly or monthly "qualification" in high-priority units with substantial turnover? Since individual AFV performance can now be instrumented in extraordinary detail, why not shift the focus of all gunnery to platoon or company echelon? Train and evaluate individual AFV proficiency in the context of larger unit operations.

Finally, it is essential to determine when live fire gunnery is fired and for what purposes. If the reason is to battle-condition as well as to validate full-up proficiency on one's own equipment on the ground, then design specific, very demanding learning experiences achieved through virtual simulation as well as live fire. After basic gunnery proficiency validated in UCOFT and CCTT, fire four to six main gun rounds monthly in an individual tank very high-stress battle run involving the sounds and smells of combat (burned animal flesh, etc.) with incoming RPG. In other words, when the unit goes live fire on the ground, design the maximum realism into the exercise. The training policy is high quality over quantity. This type of structured training experience is expensive to create but much cheaper than the current MPRC and ammo cost of Table VIII across the force. After the individual AFV training, all live fire is in CALFEX with other arms and close air support—the full combat team.

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5 Lots of devices involving sub caliber appended and in-bore devices.

Few if any of the issues raised above have been considered during the past several years. For all of the reasons stated above, it is exceedingly difficult to justify current live ammunition requirements for AFV gunnery. Now, the entire tempo of the close-in fight is about to change with the introduction of appliqués providing digitized information, and at the same time, there is no detailed training package available for fielding of the first AFV with these capabilities, the M1A2 in 1995 with IVIS. Again, this shortfall is the result of inadequate training development.[6]

Lack of thinking ahead in training development is one problem.[7] Equally troubling is the inability to capitalize on a proven breakthrough in training development by applying the advance to other training challenges. The UCOFT was purchased as a gunnery training simulator. It is well accepted after about 5 years' use as both necessary and appropriate. It is much more. It is a very effective training "machine" as it observes performance, diagnoses training deficiencies, then prescribes remedial training for the AFV vehicle commander and gunner. This capability has not been sought in any subsequent Army training development,[8] even though the tables and modules of SIMUTA seem to provide a very useful vehicle for extension of the COFT training principles to small unit collective training. Consider a COFT-like training experience for the new S3 or an RC platoon leader or for the company commander working with his FIST and platoon leaders, or for the S2, S3, and FSO training the synchronization of direct and indirect fires for battalion defense in sector.

The perplexing training development issue is how to ensure in the future that proven success can be translated from one training area or domain to another.

B. INTEGRATING TRAINING APPLICATIONS

Another measure of effective training development should be its application to integrate training across different elements of the overall training system. An example would be to use the new distributed communications capabilities of the "Information Superhighway" to link institutional training between the school house and regional training facilities. TRADOC has done an excellent job in thinking through the "school without

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6 Training packages were prepared for M1A2s for the Saudis. They are distinguished by their lack of focus on the new information sharing capabilities.

7 Or of "futures" training development not recognized as important and therefore not funded.

8 The UCOFT precedent may be about to become a training development requirement. See the Event Generator in the TSP of *Warfighter XXI A—Vision for Army Training*, Version 2, December 1994, p. 1-33 (Enclosure 1).

walls." Innovative training development integrates and multiplies the impact of improved classroom training and distributed information.

Unfortunately this integrating application of training development has not been extended to collective training in units. Two major investments have been made recently by the Army to support unit training. They are distributed TES and the CTC complexes. Today, the two are not tied together. That is, despite the potential for standardization enabled by common tasks, conditions, and standards, there is no formal tie between training proficiency generated at home station employing TES and subsequent performance at the CTC. Nor is there a tie from the CTC to continuing training back at homestation. There is a need to link digital (TES at home) to analog (on the ground at the CTC) back to digital (TES at home).[9]

The issue is not advocacy of any particular method to tie together these two major training investments. The issue is sensitivity to using training development to encourage improved use of both very considerable training assets individually and to create a training whole much greater than the sum of the parts. By tying proficiency in tables between home and the CTC, there is continuing opportunity for the unit to confirm the value of TES through cross-checking performance in simulation to actual performance at the CTC. So training development could provide a TES feedback loop—should this be seen as a useful capability of training development in the Information Age.

Another potential opportunity would be to encourage and in fact enable the unit to follow up its CTC training with more advanced Force XXI training back home by training to tasks too costly, unsafe, or ecologically unsound for the CTC. TES becomes a means of extending training opportunities of the CTCs. Whether leader or unit training, the TES-CTC links described should encourage higher training effectiveness and efficiency in homestation training. Although it establishes useful precedents for later export of the training on to worksite or actual home with new distributed TES, it is a path yet to be explored by training development. The immediate challenge—how to improve the usefulness of existing training investments—is more mundane.

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9 For a more detailed discussion, see Holtz, Hiller, and McFann, *Determinants of Effective Unit Performance*, Section IV, USARI, 1994, pp. 281–298.

C. IMPROVING EXISTING CAPABILITIES

Improvement of existing capabilities is the last area of disappointment in current training development for collective training in units. Design of the training experience at the CTC-NTC is a case in point. Innovative thought has been applied to improving what is being done today, but there has been no serious review of the design of the training since the Cold War ended. Solid incremental improvements have been instituted largely at the instigation of innovative CTC commanders and Chief, Operations Groups (COGs). Mission rehearsal relevance was demonstrated in good TTP and training development for Desert Storm. There has been steady pressure to extend the training from battalion echelon to brigade. This has been matched by increasing attention to improving the training experience for the other units of the Brigade Combat Team--the direct support artillery battalion, the engineer battalion, the ADA battery, and the forward support battalion. But these are predictable, evolutionary trends which would have occurred whether or not the Cold War had ended or the industrial age been supplanted by the information age.[10]

Much more substantial collective training development could have been occurring over the past decade. Figure III-1 is one conceptualization of what might be done at the NTC—not to advocate any particular change but to demonstrate the nature of strategic training development that could be ongoing but is not.

The diagram represents a 7-day period of force-on-force operations. The horizontal blocks portray conventional brigade Task Force (TF) combat operations much as they are conducted today with one exception. The operations are continuous; that is, conducted without pause for AARs with one mission followed immediately by another for 48 then 72 hours.[11] The vertical blocks represent pauses of 24 hours for rearming, refitting, and formal detailed, instrumented AARs and remedial training to correct shortfalls revealed during the preceding tactical operations. More important, the pauses in maneuver brigade operations create the opportunities for vertical training in likely force projection operations. In block B, fire support is trained from FIST to corps echelon as U.S. fire support might be committed in support of a regional contingency operation—analogous to ADA deployed in Israel during Desert Storm. In block D, CSS medical is trained as a major medical commitment might be required after earthquakes in the Caucasus or along the Great Rift in Africa or after another Chernobyl.

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10 For other evolutionary changes see Mounted Maneuver Battalion Command/Staff Training: Training Policy, Development and Support Applications, December 27, 1994 (Enclosure 3).

11 There could be quick-response hasty "Hummer-top" AARs between hasty missions.

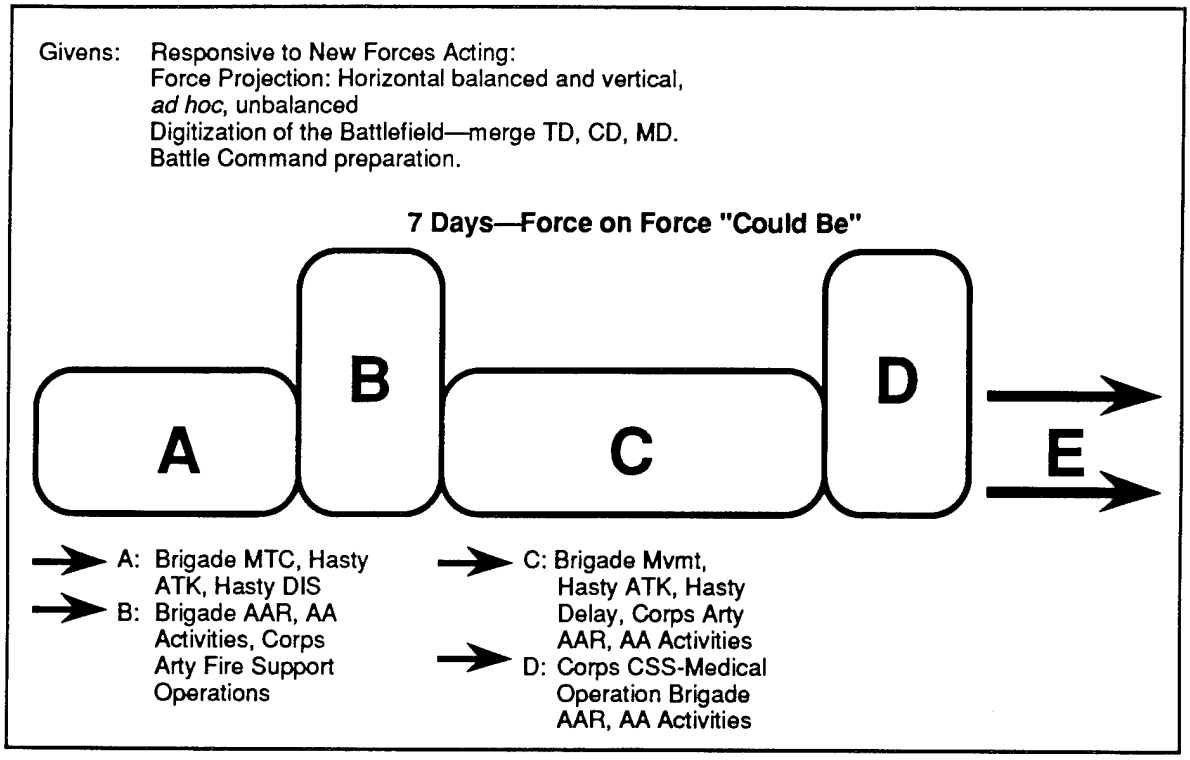

Figure III-1. NTC Collective Training Development Option

This schedule not only trains balanced TF and *ad hoc* functional organizations but also trains Force XXI Operations as continuous operations increase the tempo of operations. One could also argue that this type of schedule better amortizes the investment costs of the instrumentation system, the OCs and the OPFOR. If the training events, particularly the vertical ones, were to be distributed to homestation in digital-analog-digital as suggested above, there could be a much broader range of Joint and combined training opportunities available. For the first time, there would be training support available to train all likely combat, combat support or combat service support colonel commanders in likely force projection operations using a combination of live, virtual, and constructive simulations.

The point is that most of the major investment costs have been made to enable all this. What is lacking is a core of competence in strategic training development which could translate operational requirements to the training policy and training development, which would take advantage of very significant existing training support.[12]

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12 I suspect that this void exists also at Division and above, as manifested in the Battle Command Training Program (BCTP), which has not changed noticeably in almost 10 years, but my research has focused at brigade and below.

IV. NEW MISSIONS AND CAPABILITIES

A. CHALLENGES AND OPPORTUNITIES

Before proposing policies and programs for the future, it is useful to look more explicitly at both the challenges and opportunities that lie ahead. Fortunately, the opportunities appear to far outweigh the challenges.

There is significant overlap between training requirements associated with general exploitation of the potential of TES and the requirements of the Information Age material developer. The primary characteristic of the emerging Information Age is the dominant role of information. For the Army, this translates to determining the *battlefield information needs* for commanders and staff officers at each echelon, and providing that information when and as it is needed. The challenge is not to provide streams of raw information, as does the Army Battle Command System (ABCS) in the Maneuver Control System, but to provide exactly the detail required when the tactical commander wants it. The need for this detail was one of the prime Lessons Learned from Desert Hammer, the Army Warfighting Experiment (AWE) in digitization conducted in NTC Rotation 94-07.[1]

Serendipitously, the training developer requires exactly the same information when designing a structured training program. When training individual and collective basic tasks, experience is proving that both *definition* of task, condition, standard, and a detailed *demonstration* are required for effective learning. The rationale was explained in Chapter II in discussing ways to improve BCST. The example used was the task resolution required to train the fire support team. Imprecise requirements, as expressed in current generalized MTPs, give way to very high detail once the task is related to specific actions related to specific METT-T. This detail becomes the blueprint for the material developer: it defines what information digitization must provide, to whom, and when in a typical tactical mission; user success has been defined equally well for purposes of hardware and software development.[2]

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1 Observation derived from personal participation in 94-07 as a quasi-OC, start to finish.

2 See explanation in Enclosure 2.

A battalion echelon base case has been provided by SIMUTA for the developer of FBCB2. The software produced by TRW/CECOM could be expected to provide at least the generic capability demonstrated in the SIMUTA tables and modules which portray war-fighting, currently in a manual decision-making mode. SIMUTA can provide a highly detailed statement of minimum performance required. Later, the same structured training methodology should be applicable as improved software evolves. That is, the tables and modules can be modified to provide an iterative moving baseline as AWE proceeds. The training package becomes the baseline developer requirement.[3]

This insight seems to be applicable well beyond FBCB2. In fact, the information detail requirements for the developer converge with the training program requirements for the unit chain of command. This would seem to extend to material development supporting digitization at least to Corps and across the Joint and combined spectrum of operations. Task, condition, and standard with highly detailed demonstration, built quickly for unit trials early in TES, seem likely to be the practical blueprints for Information Age Army development.[4]

This insight is central to realizing much of the promise of digitization. Therefore, it is appropriate to explain more completely the remarkable detail of the current product, SIMUTA. In preparing the training support necessary to train the battalion staff, several matrixes had to be developed so that both staff officer and OC had sufficient detail to conduct the training. A Key Actions Matrix was prepared for each principal staff position. This matrix identified the event or cue necessary to cause training to occur as well as the time, task, required action, and other related actions. To better understand how staff officer actions translate to battlefield interactions of the various BOS, a Decision Synchronization Matrix was created to place friendly and enemy events on a common time-line, grouped by BOS. Thus, the interactions required to create effective synchronization were made explicit.

The detail provided in the SIMUTA matrixes is remarkable. Figure IV-1 is one page from the matrix for the battalion S3 in the defense in sector scenario. Note that the

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3 Another very useful byproduct is that the existence of the structured training "a way" permits detailed on-equipment orientation (training) of the software engineers in tactical effects, stresses and strains that will be placed on their product. This was found to be exceedingly useful in developing SIMNET. It establishes a bond of common experience between technician and soldier.

4 If and as this is understood, funding of training development should prosper.

Example of "how to" use a Key Action Observation Matrix prepared for Bn S3 staf training in the defense RCVTP at Fort Knox

Event/Cue (Collect)	Time	Step/ Task	Required Action	√	Related Action	√
Decision criteria met for initiating a counter-attack	H+1:55 to H+2:00	PROCESS information collected (7-1-3902.3)	Identifies that the report is of activity in the unit AO			
			Identifies that the report conforms to expected activity			
			Identifies that the decision criteria for "Counterattack into EA MICHIGAN" or "Counter-attack into EA ALABAMA" have been met		Inform XO	
			Coordinates with S2 and determines the likely time and location that the 2d echelon MRR will reach PL AUSTIN and either EA WISCONSIN or EA LOUISIANA		Inform XO	
			Identifies that subordinate and supporting units are in appropriate positions with sufficient resources to conduct the operation as planned			
			Determines that higher and adjacent unit operations are not negatively affected			
			Determines that initiating "Counter-attack into EA MICHIGAN" or "Counterattack into EA ALABAMA" should be recommended to the XO (if not already determined by the XO or Bn/TF Cdr)			
			Determines that directives are required to combat trains, mortar platoons, and engineer company, as required		Confirm with XO	
			Determines that coordination is required for movement of B around flank of D (if event is "Counter-attack into EA MICHIGAN"		Confirm with XO	
			Determines that current situation report should be disseminated to the Bde HQs and all staff sections		Confirm with XO	
		EXECUTE required actions (7-2-3904.14)	Recommends to the XO that "Counterattack into EA MICHIGAN" or "Counterattack into EA ALA-BAMA" be initiated (if required)		Execute actions directed by the XO	

Source: Extracted Decision Synchronization Matrix Instructions (Defense) Battalion Task Force Key Action Observation Matrices, J.M. Harper and M. Keenan, "Battalion Task Force Staff Section Observation Matrices," Draft ARI Research Product.

Figure IV-1. A Key Action Observation Matrix

focus in this portion of the training development for BCST deals exclusively with the execution phase of the tactical decision-making process. The planning and preparation phases to identical METT-T have been completed but all three phases are yet to be linked. Also, the current product describes only the requirements for individual staff officers. Training support for staff teams such as the S2, S3, and FSO have yet to be completed.[5]

Similar detail is provided in the Decision Synchronization Matrix (Figure IV-2). This example is extracted from Battalion Defense in Sector and concerns the actions of the battalion scouts as the enemy attack progresses. This is not presented as the only way to execute the mission, certainly not as a "school solution." But it is "a way" a competent unit executes during Defense in Sector. Equipped with this detail, the material developer has just been presented a major assist as he builds FBCB2. Without this training support material to serve as a detailed functional description of successful tactical performance, the contractor would have to develop it and then convince the Army to accept the product as a description of success.

While solid work has been completed and continues to extend the methodology to brigade echelon, there is considerable work yet to be done to guide future training to accompany evolving digitization. The detailed architecture of the Joint battlefield is yet to be delineated and tough doctrinal questions need to be answered about the future tactical decision-making process. Excellent work is underway to better define the architecture of the battlefield. That is, to define in greater detail the various functions that must be accomplished to execute current doctrine, tactics, techniques and procedures. This effort to identify Critical Combat Functions (CCF) has been underway for several years.[6] The initial emphasis was at battalion echelon. That work guided SIMUTA training development. Now the focus is on expanding the development to brigade as well as looking in greater depth at one function, fire support, vertically from the company FIST to division. This latter effort is supported by a supplementary effort to translate the army architecture to Joint operations. The research vehicle is Close Air Support defined as a subset of Fire Support.

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5 This extraordinary detail should also be exceedingly useful for institutional training particularly as and if the same scenario (table/module) is used in both school house and unit. This common base of staff TCS and "a way" could be quickly translated into the METT-T of the objective area for Force Projection Operations to train staffs in the TCS of control.

6 The CCF effort continues for ARI. The prime contractor is BDM Federal, Inc., under the direction of W.J. Mullen III (BG, USA, Ret.).

Example of "how to" use a Decision Synchronization Matrix prepared for Bn defense training in the RCVTP at Fort Knox

C. Thirty minutes after the scout platoon reported the two enemy formations at NK 378137 and NK 387160, enemy resistance in EA WISCONSIN was light with less than 10 reported operational tanks and BMPs remaining stationary at NK 398139. The scout platoon reports another large enemy formation of at least 20 tanks and BMPs at NK 347162 moving southeast. For friendly units, B Company reports having 9 operational tanks and Team (company) C reports being RED on ammunition and BLACK on TOW missiles. The S-2 or S-3 sections at the main CP receives and disseminates the messages inside the CP. The XO identifies that the decision criteria for executing the event "Displace to orient on EA MICHIGAN" have been met. He informs the battalion commander. The commander agrees with the assessment and orders initiation of the event. Depending on unit SOP, the commander, XO, or S-3 will issue specific orders to subordinate maneuver, combat support, and combat service support units. Upon receipt of the orders, the subordinate and direct support units execute the tasks listed in their row under the column for the event "Displace to orient on EA MICHIGAN." The staff sections at the main CP monitor the subordinate and direct support unit activity to ensure that assigned tasks are being accomplished. The XO identifies that the next event is "Counterattack into EA MICHIGAN" or "DISPLACE to orient on EA VIRGINIA."

Source: Extracted Decision Synchronization Matrix Instructions (Defense) Battalion Task Force Staff Section Observation Matrices

Figure IV-2. A Decision Synchronization Matrix

The emerging product is very useful. The CCF analysis establishes likely nodes of interaction of tasks both vertical (by function) and horizontal (by echelon). Once established, these nodes will guide the research effort to lay out the tables/modules to define the staff tasks and to build the "a way." The CCF are the foundation and framework that permit the detailed architecture of the battlefield which is necessary for both material and training development.[7]

Detailed analysis also reveals areas needing more research. For example, the CCF effort highlighted emphasis on planning and preparation as opposed to execution, which has characterized the tactical decision-making process for several years.[8] As the tempo of the battlefield increases, it would appear that there will be a much greater requirement for

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7 It is less clear that the Industrial Age training development process used in developing the CCF is suitable for timely completion of this important effort.

8 For a more detailed discussion of this issue, see the paper *Mounted Maneuver Battalion Command/Staff Training: Training Policy, Development and Support Applications*, 12/27/94, at Enclosure.

quick response combat decision-making. Perhaps rather than the decision model, *plan, prepare, execute*, a better decision model would be *monitor, plan, and direct,* once warfighting begins at battalion and brigade echelons.[9] This CCF work brings these sorts of practical issues to the forefront as it better defines the army and Joint battlefield. Such detail is necessary to define explicit training requirements and, as CECOM will discover, to frame the software requirements for digitization. Although slow, costly, and laborious, this effort should continue.[10]

This is just one example of the new training development that will be required. In this case, as the pace of mid-intensity battle picks up with Force XXI Operations, new training development modifies the tactical decision-making process and with it the taxonomy of training requirements. At a minimum, it changes the task loading of the battlefield mission execution particularly for commanders. Similar results can be expected as both peacekeeping/enforcement operations and the U.S. response evolve. All presage a continuing requirement for training development. In fact, some form of ongoing "living development" seems appropriate to keep pace with the pace of change.

The one certainty of the Information Age appears to be change, usually more rapid than anticipated. Change is always difficult to accommodate, particularly in a necessarily conservative organization. Fortunately there are new tools available to both accelerate the change and to ease its acceptance.[11] TES, particularly virtual simulation, permits creation of "futures" in a known battlefield context so the impact of the change can be assessed by

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9 Changes to the tactical decision-making model addressing execution seem necessary. There is undesirable imprecision at present. For example, ARI/BDM developed common tasks included in a *monitor* addition to *plan, prepare, execute*. During any phase of combat where time permits, leaders should supervise continuing preparation; that shows command emphasis, corrects weaknesses based on the inexperience of junior leaders, and builds mutual trust and confidence with junior leaders and soldiers (if handled as tutoring instead of fault-finding). But once the pace of battle quickens, supervision of preparation should be allowed to naturally abate.

The point is that the current tactical decision-making model appears sequential, either *planning* or *preparation* or *execution*, when in fact some of each is occurring. This sequential approach is exacerbated when OCs, reluctant to let go as the unit executes, miss the point of how tactical decision-making processes change during execution.

10 The parallel to the enormous effort required to define task, condition and standard during the seventies and eighties is direct and appropriate. There may be shortcuts coming. For example, TES-generated "a way" can be examined in execution to define nodes and staff tasks. Use the new capabilities to create "futures" in virtual simulation which can be analyzed, thereby reducing the time-consuming front end analysis mandated by the System Approach to Training. This potential is discussed in Chapter V.

11 The Army already has accepted remarkable change in every aspect of policy. For example, soldiers accepted fighting with a processed (indirect) image, the Tank Thermal Sight, quickly. It worked, clearly and unequivocally. To continue the analogy, when kicked, these "tires" were solid. How to duplicate in the future with intensified highly processed information loading—visual, oral, tactile?

sergeants' and captains' abilities to see the product, to "kick the tires." New alternatives or "marks on the wall" can be created in response to comments of small unit leaders.[12] When consensus is established that the mark is about right, review it carefully, and describe the TCS observed. Those TCS then define the software development requirements as they lay out the structured training required to train individuals or teams. In fact, the "mark on the wall" that is about right can become "a way." Now, fight the tentative product whether it is new information on a vehicle display or a new TTP or a new organization. Iterate until it seems close enough to execute on the ground in live simulation. Note that the critical path for all possible courses is the detailed definition of what the individual or small team has to do (in TCS). Virtual simulation permits absolute replication of every object on the battlefield in time and space—an unprecedented opportunity to control variables on the tactical battlefield.

B. APPLICATION OF VIRTUAL SIMULATION TO TRAINING DEVELOPMENT

In the context of this paper, applications are for training development, but broader applications seem present for force development, combat development and, especially, material development. That is "living development."

There are several insights here that individually and in combination may offer exceptional potential. The insights are grounded in the fundamental characteristics of the tables or modules themselves. That is, they are by definition, extraordinarily detailed descriptions of warfighting. They detail battlefield actions to the inch and second on a digital terrain data base. And they are absolutely replicable. Each object can be put back in place as many times as the training or research requires. This is invaluable for assessing the capabilities of new training support.

First and foremost, tables and modules would seem to provide a very useful baseline for assessment of the training benefit of new collective training support such as test and evaluation community evaluation of the CCTT. Generic "a way" could be training battalion (or company or platoon) using the current SIMNET. That "a way" mission then can be modified to a new "a way" reflecting the new capabilities presented by CCTT. For example, vastly improved representation of various visibility conditions can become the

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12 The mark could be a new organization, new material capability or perhaps new tactics, techniques or procedures. The point is: it is easy to adjust to user comments in TES, particularly visual virtual simulation.

focus for training of the unit which has been provided CCTT for evaluation in a comprehensive training program. As the unit develops individual, team or small unit proficiency to that new capability, "a way" improvements resulting from use of the CCTT compared to the old "a way" in SIMNET become evident and highly quantifiable.

The same analytical opportunity should apply equally to BLTM revision. Comparison of resources required to attain detailed "a way" proficiency can provide justification of the resources mandated in the BLTM in solid performance data. In other words, the rigor of tables in TES permits very detailed analysis of the resource requirements required to reach a specified level of individual or collective training proficiency. In time, this rigor seems certain to enter into Operational Readiness (OPRED) determination methodology.

Perhaps the most immediate, and potentially one of the most significant, uses of "a way" will be its application as the "mark on the wall" for Force XXI development. The baseline "a way" reflected in the current SIMUTA is M1A1-based. But think of that as only one of many "a ways"—or "a ways" 1 to n. That same table fought with M1A2s can become the comparative baseline for assessment of units employing IVIS and the other new capabilities of the M1A2. Call that "a way" 2. Similar logic applies for development and assessment of new Tactics, Techniques, Procedures—"a way" 3. As appliqués develop, other improved software supporting horizontal integration will generate new "a ways." The variations in "a way," from generic to improved, will quantify the battlefield impact of the improvement as they serve to guide and validate proficiency with the new capabilities. "A way" may be the conceptual and practical glue effectively binding the training development and traditional development communities.[13]

Consider the following practical description of how this might work. Assume that the objective for horizontal integration is to develop the digitization required to take advantage of the M1A2 plus new tactics, techniques and procedures which the capabilities permit. That is, "a way 3" as described above. The first step is to define exactly what the new capabilities are expected to do. To provide this answer, SMEs performance-base the requirement in virtual simulation. They fight the new capability in TES. TTP become the product of actual warfighting in virtual simulation. It is a living product prepared by the SMEs—the majors and captains' hands-on experience in the simulation. No longer will the Army be obligated to paper-base the requirement as a conceptual statement derived from

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[13] Although not discussed, the same rationale should apply to test and evaluation processes.

paper excursions of imagination. The new "future" is developed by fighting on future battlefields.[14]

As soon as SMEs agree that the desired "future" has been achieved (and senior personnel can see and agree since all is in virtual simulation), freeze it (the METT-T, etc., of the fight) and export it in virtual simulation as tables and modules at the platoon, company and battalion echelons. Those tables go to the experimental force (EXFOR) tactical unit as the training program for training the unit to execute the new TTP. That is, the "a ways" from SMEs plus "your way" and "What If" STXs generated in a structured training sequence by the trainers become the training program for the EXFOR unit.

Simultaneously, the tables in virtual simulation go to the contractor (for FBCB2, TRW) as the detailed functional descriptions for writing the software. The "a way" tables are virtual simulation records of competent performance for the contractor to build to—a quick response, performance-based, highly detailed, functional description in which the user has defined competency for user train up. Neither the contractor nor the Army (or T&E community) can have any question as to what constitutes competent performance. The user has defined it in great detail.[15]

Then, when the experimental unit is trained and the contractor-produced software is ready, a mini-AWE can occur to validate that both hardware and software of digitization and a trained unit can perform as intended at that stage in the anticipated development cycle (or development spiral). Then the cycle starts again.

Note that several very significant aspects of traditional development have changed. Requirements evolve as the SMEs actually test, fix, and test the requirement in virtual simulation. Change in response to learning—a desirable part of the Information Age development process—is embedded in an inherently evolutionary process that ties the warfighter requirements generator directly to the developer. The functional description becomes an exceedingly detailed description of competent execution of the desired end state—tactical execution on a complex battlefield. It is absolutely performance-based in extraordinary detail (x, y, z, to inches and t to seconds) to guide contractor development of both hardware and software. There can be little confusion what the Army wants because

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14 In Industrial Age parlance, these are "fly before you buy" techniques for development now used by the automobile industry but now applied to force development as a product of the power of TES.

15 All must be aware, however, that the tables were created to provide a timely 80 percent answer to an agreed training deficiency. Therefore the "great detail" is only 80 percent. A process of spiral development will have to be employed to approach closer to a 100 percent solution.

the warfighting end state application of the requirement is widely available in virtual simulation. It can be distributed worldwide in DIS by the Defense Simulation Internet (DSI) for review by other agencies or services. And the functional description is simultaneously the individual, small team or small unit training program so that the spiral development process can be accelerated.

Rapid, effective passage of tactical information is the ultimate goal of Information Age development. By drawing on the capabilities of TES, the soldier under stress can be an integral part of an interactive development process.[16] In fact, training development has become material (software) development and force development simultaneously.

These are development opportunities presented by "a way." There would also seem to be parallel opportunities for using the training development to train and then validate in rehearsals the proficiency of units assembled for particular contingencies. This could be quite useful particularly when the composite unit consists of reserves, Joint personnel or soldiers from foreign armies assembled for a particular Force Projection operation, the *ad hoc* functional deployments discussed in Chapter I. A table designed to reflect individual or staff proficiency in more complex and/or normally incorrectly performed tasks could be particularly useful during marshaling both to train and to assess proficiency.

One particularly useful application is for training in those missions which are important but which may be too uncertain or unpredictable for inclusion in a unit training program. The great variety of missions possible in OOTW come to mind. Excellent training development has been done by USAREUR in preparation for potential contingency missions in OOTW. There has been little training development support from Army resources outside the command—another reflection on the moribund state of training development. But the residual training development doctrine was adequate to the task albeit with analog training support, and based entirely on seventies technologies.

Theater training support such as this which the European Command (EUCOM) developed to address a pressing operational requirement should be translated into TES-based "a ways." These could be used as training baselines for subsequent OOTW-particular "a ways" as support for actual mission train up or rehearsal. There are many

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16 And only the United States military has assimilated the combination of the rigor of task, condition, standard defining required information requirements with the fielded infrastructure of TES/CTC—all required to take advantage of this leap ahead of the mind. It is a time advantage of at least 15 to 20 years. This leap ahead is understood fortunately by senior leadership charged with execution responsibilities. See Enclosure 2.

opportunities for this form of preparation for Force Projection operations. These are CINC-based requirements which the "a way" methodology should be prepared to address.

There would appear to be a wide range of uses for "a way." This is fortunate for there are complex tasks ahead in creating Force XXI as the Army contribution to Joint force readiness. Several major efforts are ongoing to take advantage of the capabilities of TES. The ARPA-initiated STOW envisages the eventual creation of a Desert Storm-type capability in TES. In November 1994, EUCOM conducted STOW-E involving forces stationed in Europe and the United States and joined on the Defense Simulation Internet. All met on the seamless battlefield created in TES.

Here, icons of fighting vehicles and air frames, some of which were generated by Service personnel in SIMNET cabinets, some generated by constructive simulation (BBS) and some from actual units (AFV) on the battlefield at Hohenfels, could be observed on computer screens at Hohenfels. Attack helicopters (pilots flying Airnet at Fort Rucker) were visible flying over and being shot at by units placed on the battlefield in Germany by BBS. Then the attack aircraft transited to the actual maneuver area at Hohenfels, fired at and caused actual kills (kill lights) on actual tanks on the ground. Attack helicopters (simulators) flying from Rucker killed tanks at Hohenfels. It was not fully interactive training because the tanks could not see the helicopters, for now, but the potential seems obvious with heads-up displays and other comparable capabilities that are coming.

Joint forces are on the verge of requiring and, in time, possessing, training support capable of training all likely battle tasks in TES, including those too costly, too dangerous, or too ecologically unsound to be trained today. STOW efforts are paralleled by solid work in other Joint areas, but there are genuinely difficult issues for which there is increasing need for training development.

C. FUTURE TRAINING DEVELOPMENT

One of the most challenging serious defects which needs to be addressed in future training development is that the methodology of the Systems Approach to Training, the heart of the current Army training system, is based on extensive review of current practices to establish the requirement. The first step in design of training is the Front End Analysis: observe the potential audience and determine what training is required. Recent practice is to analyze existing training as it has been and is being conducted. Rigor is achieved by examining in great depth what has been done in the past. The methodology looks back not forward. As the pace of change increases, partially by design, training development must

be reoriented to look forward as an integral part of the development process. For individual tasks, largely those in the institution, this has been done by Manpower and Personnel Integration (MANPRINT), or man-in-the-loop development under the overwatch of the systems acquisition community. Collective training in the institution or training for units has not been similarly addressed.

A second problem is that current practice does not consider time to be one of the fungible resources necessary to be "funded" for training. This has been a source of great frustration for the Reserves. Active force training is designed to conserve dollars and manpower, the most precious resources for the active component. In fact, the enduring effect on army training of overlooking time has been negative. Institutional training, funded by Instructor Contact Hours, is reduced in length only with the greatest reluctance. Fewer hours of instruction justify fewer personnel and less money. Therefore, the bias, if there is one, is to expend, not conserve, time. This issue is about to become much more severe as leader proficiency in complex computer-based tasks becomes a major time requirement for all leaders, particularly those who fight from AFV. Appliqués seem certain to require much more personal time to gain and retain proficiency. Time may have to become a valuable, funded, resource and be included as a fungible resource in resource generation models.

Another issue is that past training development has tended not to consider tasks that might be possible to train in simulation. Task analyses reflect what we can experience and remember in the world outside of the simulation environment. This is the Range 301 problem discussed in Chapter III. There is great reluctance to create new futures reflecting all likely wartime tasks, even the tasks too costly, dangerous or ecologically unsound to observe in a live range environment. The mind set must become one of generating likely futures in TES (live, virtual and constructive), then analyzing successful performance of those events to generate new tasks for training. The "a way" methodology suggested above for development of appliqués is intended to address this challenge.

Current training doctrine also does not reflect post Cold War training requirements. Forces no longer have the clear threat which generated the General Defense Plan Battle-Book, an excellent stimulant for warfighting training in the unit. Force projection presents very different requirements as time and locale of deployment fluctuate as international commitments vary. *Ad hoc* units are created to match functions required in the various Force Projection operations. Training has not yet responded to this challenge or to the

turbulence and turnover associated with increasing requirements with decreasing end strength.

Add to this the reduced training development resources available in TRADOC, and it is evident why some of the connectivity suggested in earlier chapters is exceedingly difficult to achieve in practice. There are no certain, quick-fix solutions. Some approaches to create or increase synergy of various projects are suggested below; the long-term solution requires addressing, step-by-step, the issues raised.

One of the first steps to be taken, irrespective of specific measures, is to establish a comprehensive design for how the Army approaches training. As discussed in Chapter III, there are three distinct aspects to creating training for the Army, whether individual or collective for unit or institution: training policy, training development, and training support (see Figure IV-3). The premise is that effective training is the result of the integrated expression of all three. Any two will be insufficient; all three must be present and synchronized for solid unit training to occur.

- **Training Policy**
  - Resource justification (Student contact hours)
  - ATXXI Campaign Plan
- **Training Development (TDev)**
  - Training research
  - Training requirements (Tasks, Conditions, Standards)
  - Training strategies, policies, programs which
    - Address individuals, units, and staffs in institutions and units
    - Train/evaluate to standard
- **Training Support (TSup)**
  - Tactical Engagement Simulation (fixed and distributed)
  - TADSS (traditional training aids, devices, simulators, etc.)

Figure IV-3. A New Model of Training Design

The best representation of training policy is the current effort to lay out an integrated plan for moving Army training into Force XXI. A campaign plan has been prepared that integrates into one comprehensive document many aspects of how future training in units will be conducted. This plan, Warfighter XXI, is to be complemented by a parallel plan for institutional training. This is exactly what is necessary at the strategic level. While the details will change, this type of planning provides the central focus essential for such a complex effort across a global organization facing very diverse missions.

Other training policy areas are equally important. The rules for justification of resources for training are vital for they will inevitably shape resource use. Resourcing by Instructor Contact Hours and reimbursement for doctrine literature by the page are examples of resource policy which have seriously slowed development of distributed training in TRADOC. Another example of a past training policy decision with profound impact today is the decision in the seventies to convert the Program of Instruction (POI) of the various officer advance courses to training future company commanders, with accompanying reduction in training for battalion staff positions. Much of the current challenge in BCST dates from that training policy decision. By specifically highlighting the training policy and establishing it as the base from which training development and training support must proceed, we establish the necessary rigor in creation of training. Sensible policy must precede all else. The responsibility for effective training policy can only rest with the various chains of command.

The next step, honored more in absence than in observance, is to determine what is to be done, that is, what is to be trained. Determining the tasks, conditions, standards which must be trained and the training programs which will be created to satisfy the varied requirements of the Army, must be done before creating the training support that will cause the actual training to occur, i.e., building the hardware.

All training is evaluation, all evaluation is training. How is this simple but very powerful statement to be enabled as the training is executed either in unit or in institution? Often training development considerations can be quite complex, as indicated throughout this paper. It is difficult to allocate responsibilities for training development. TRADOC would seem a logical choice; but, over the years, TRADOC has circumscribed its responsibilities to training development for the institution.[17] Unit development has lagged; there is no central focus today. By default, the responsibility should rest with the Army Staff, DAMO-TR, since there is an inevitable and desirable sharing of responsibility for conduct of training between TRADOC and the other Major Commands of the Army. As was acknowledged in the original Army Training Board, effective training in units is a Department of the Army concern.

Training support is much more widely understood than is training development. Training support is the material capability that enables the necessary training to task,

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17 Not intended as a negative comment. As the Army has built down, TRADOC has focused necessarily on its basic, primary mission, which is institutional training.

condition and standard. Examples are COFT, MPRC, SIMNET, or CCTT/CATT (Combined Arms Tactical Training) which, by their cost, are highly visible throughout their development process. Because of the visibility and effective controls of the acquisition system, suitable governance of training support has been created by Army Materiel Command. AMC/STRICOM is well in charge. The only issue here is that it is perhaps too good. The competence of the training support tends to overwhelm both training policy and training development, resulting in an often unbalanced training product.

One of the abiding problems in working these training issues is the general assumption that each officer and NCO is a good trainer. The myth is that any competent professional soldier can walk in and do a credible job. Training today is complex business; nowhere is this the case more than in the kinds of "futures" issues discussed in this chapter. The "digital future" is clearly coming, particularly in the United States. The Army, in fact all of the Military Services, have been provided a useful paradigm of TES, which is increasingly understood, particularly by the mounted close combat force. Neither the "digital future" nor the TES paradigm, powerful as they may be, are enough alone.

There are three major requirements that must be satisfied to ensure that training keeps up with the intended pace of Force XXI: institutionalization of agreed processes governing the design of training; tying training development to the other forms of material and force development so there is an integrated product; and recreating sufficient organizational "mass" to support innovative development despite the building down of the Army.

The first requirement suggests adoption of the training policy, training development, training support model discussed above. There may be other more useful formulations, but that is a start which could be applied to ongoing efforts such as creation of Warfighter XXI and the Force XXI Training Program. The second requirement may be met as the FBCB2 contractor begins to develop the software required to support mission accomplishment of force digitization. As discussed above, the tasks, conditions and standards which govern training also define the functional requirements for digitization software. This synergy should serve to blend training development to combat, material and force development. Needed, perhaps, is some form of integrating organization such as a training Battle Lab chartered to integrate the various efforts to produce both horizontal and vertical training in support of Force XXI.

The third requirement is more difficult to achieve because it crosses traditional boundaries of responsibilities. As the Army builds down, formerly robust organizations such as TRADOC become less and less capable of supporting vigorous development. It is

increasingly difficult to perform to expectations in the routine of institutional training, much less expend resources on uncertain futures of unit training. There are three major contributors to unit training. They are (1) the chain of command, which must have the primary responsibility, (2) the TRADOC proponent, and (3) the appropriate CTC, a relatively new training support capability that may transcend the total capabilities of TRADOC as envisaged in the seventies. For mounted close combat capability, that combination translates to III Corps, the Armor Center as Mounted Force proponent, and the National Training Center.[18] Some organizational framework in which these capabilities are most efficiently linked seems essential.[19]

D. TRAINING DEVELOPMENT OBJECTIVES

There are at least three groups of development objectives which can be served by implementation of the structured training proposed in this paper.

The baseline group is reflected in Figure IV-4.[20] SIMUTA at battalion expands to brigade with SIMBART and the FXXI Training Program. Once this is done, the rigor of TCS description, particularly "a way" tables/modules, provide the necessary detail for the other programs.

The detailed descriptions and structured training programs can also support experimentation for the WFXXI Experimental Force. "A ways" can be created for different combinations of doctrine, organization, material and personnel. With modifications to baseline of IVIS, this same methodology could apply to M1A2 fielding as is indicated in Figure IV-5 below.

This detail also can provide the rigor of structured training to tie the management of training to the determination of training readiness for operational readiness reporting. Other uses are certain to develop, such as the application of TCS and structured training for Initial Operational Test and Evaluation (IOTE) of new training support. In fact, the Army may be only scratching the surface of a new range of Information Age training products. For example, training development associated with EXFOR development would be applicable in many other areas normally associated with both development and training management as indicated in Figures IV-6 and IV-7 .

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18 The CMTC at Hohenfels is a clear contributor but as the "trainer" for a regional CINC, the scope is considerably larger.

19 And this may be happening as the Experimental Force for Army XXI begins to take form at Fort Hood.

20 With due apology for the abbreviations and jargon. Please review the Glossary.

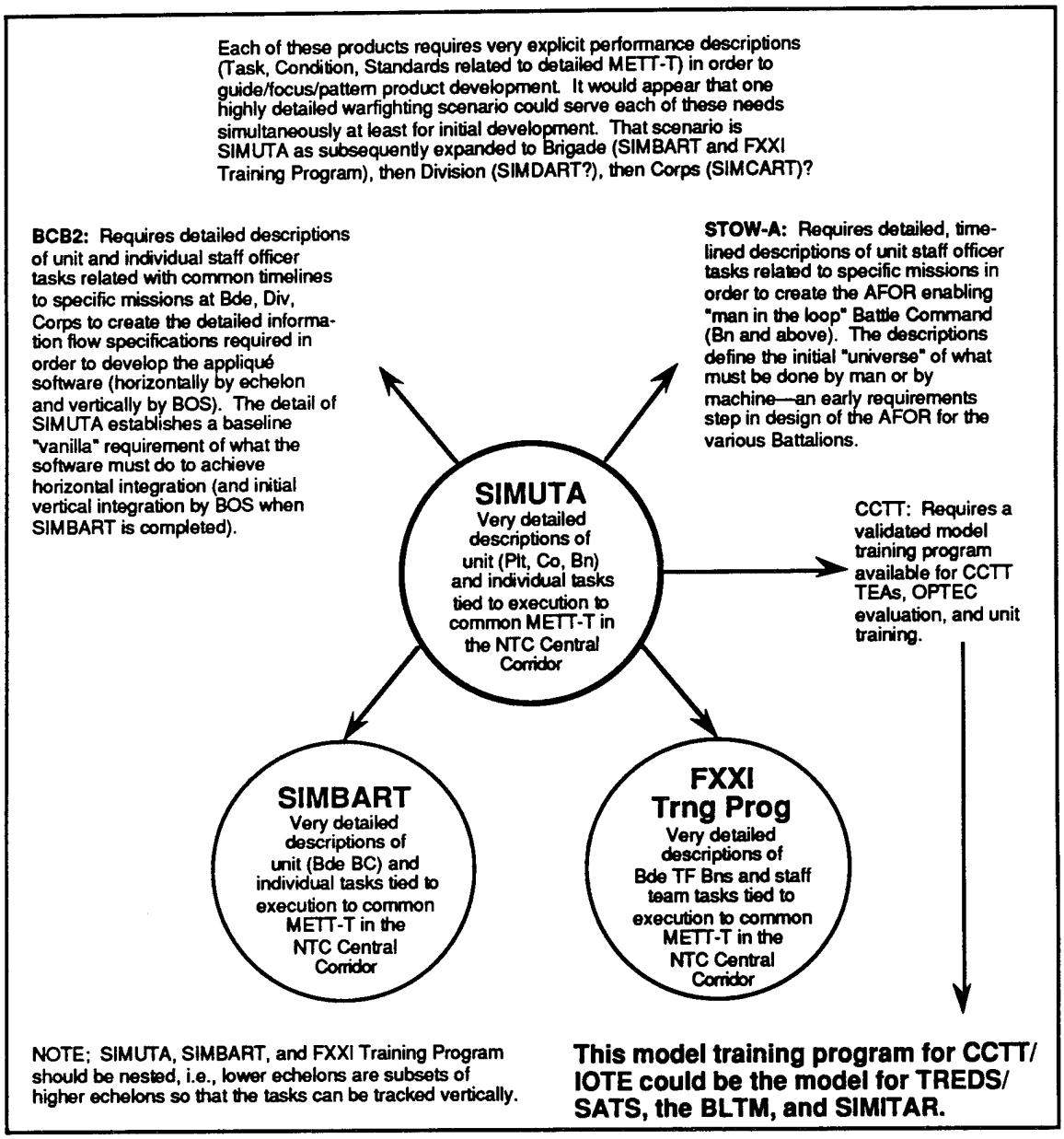

Figure IV-4. SIMBART, FXXI Training Program FXXI BCB2, STOW-A, CATT

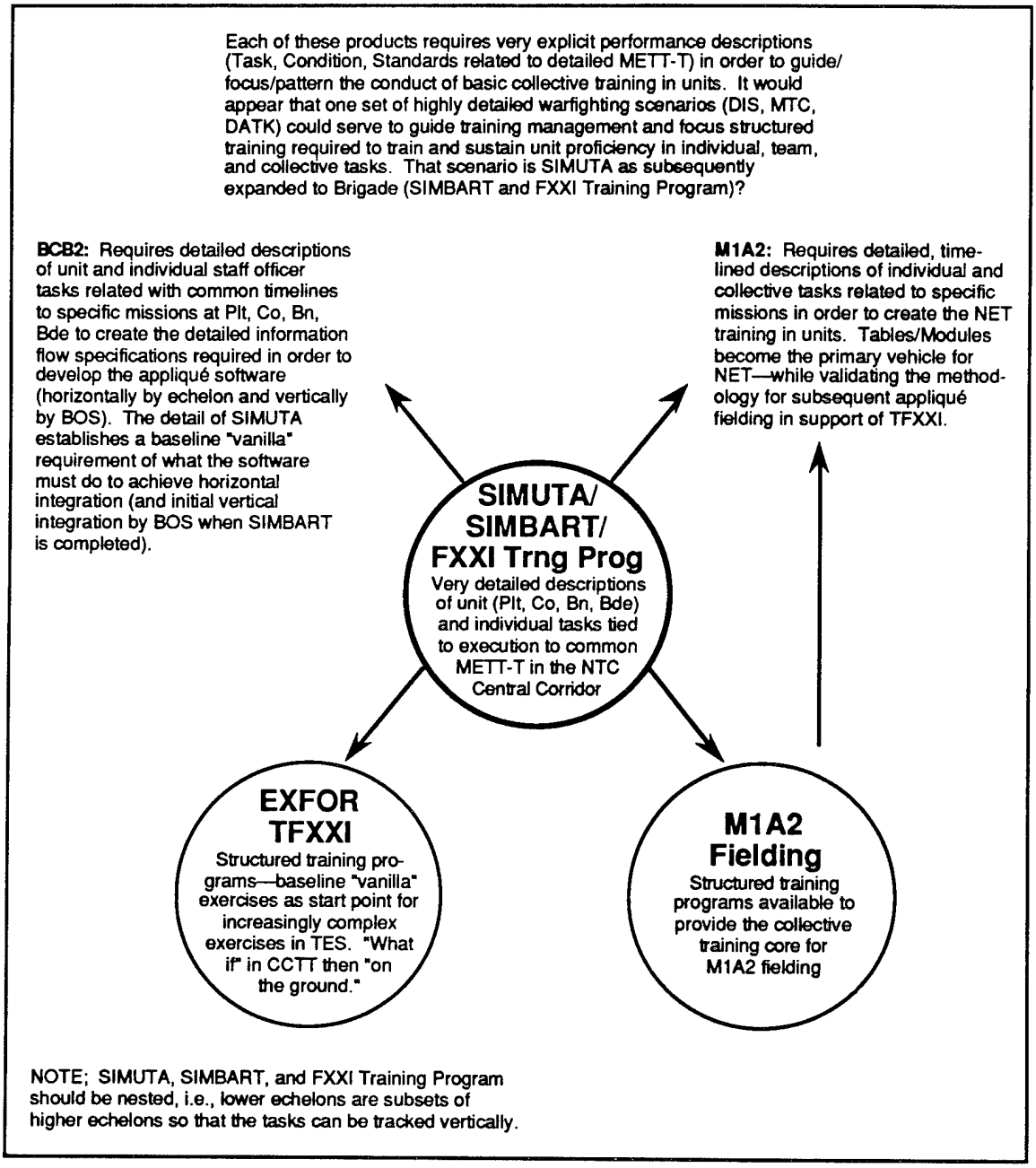

Figure IV-5. EXFOR-TFXXI, M1A2 Fielding, BCB2 Dev.

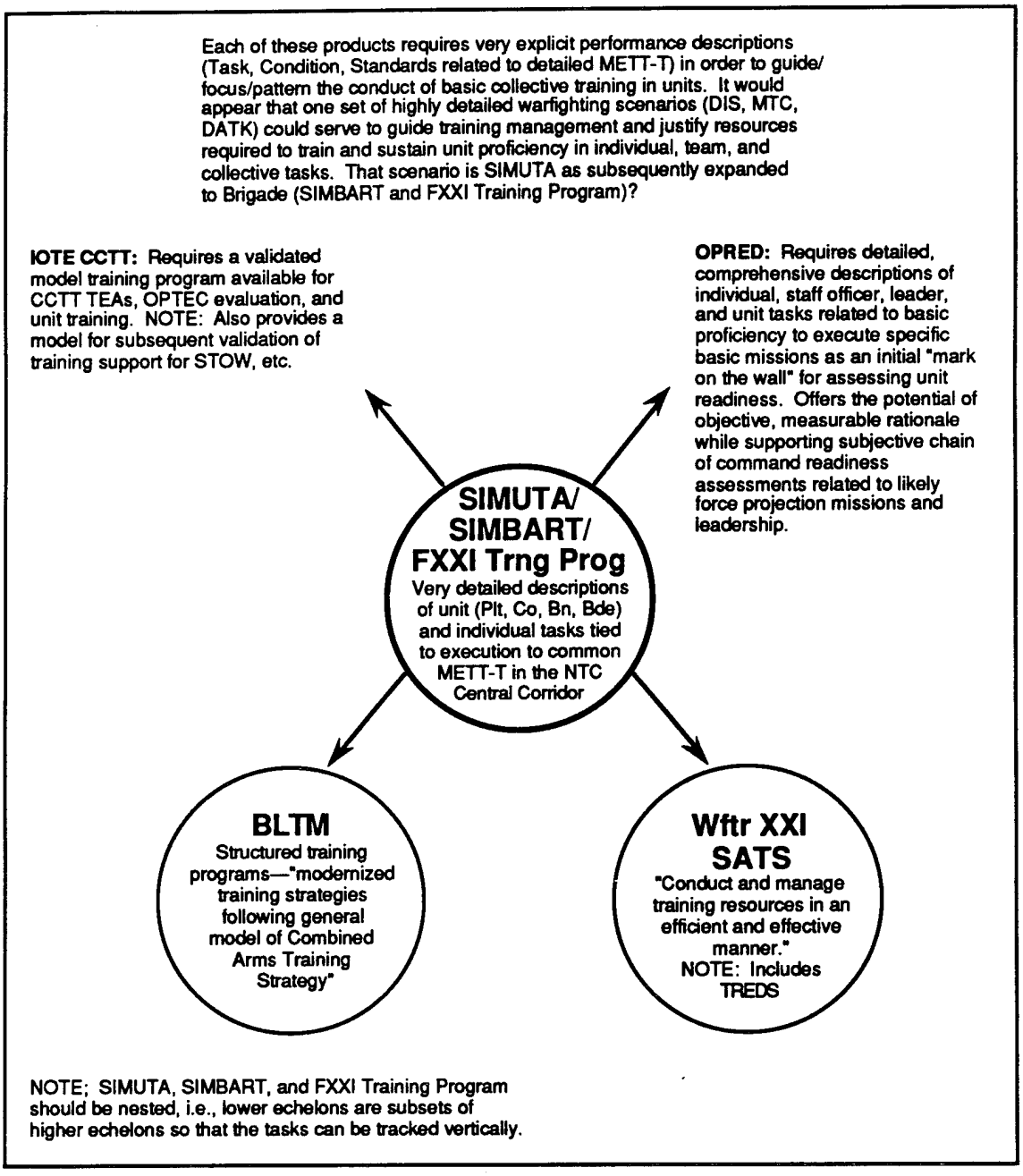

Figure IV-6. SATS, BLTM, CATS-WftrXXI, OPRED, CCTT IOTE

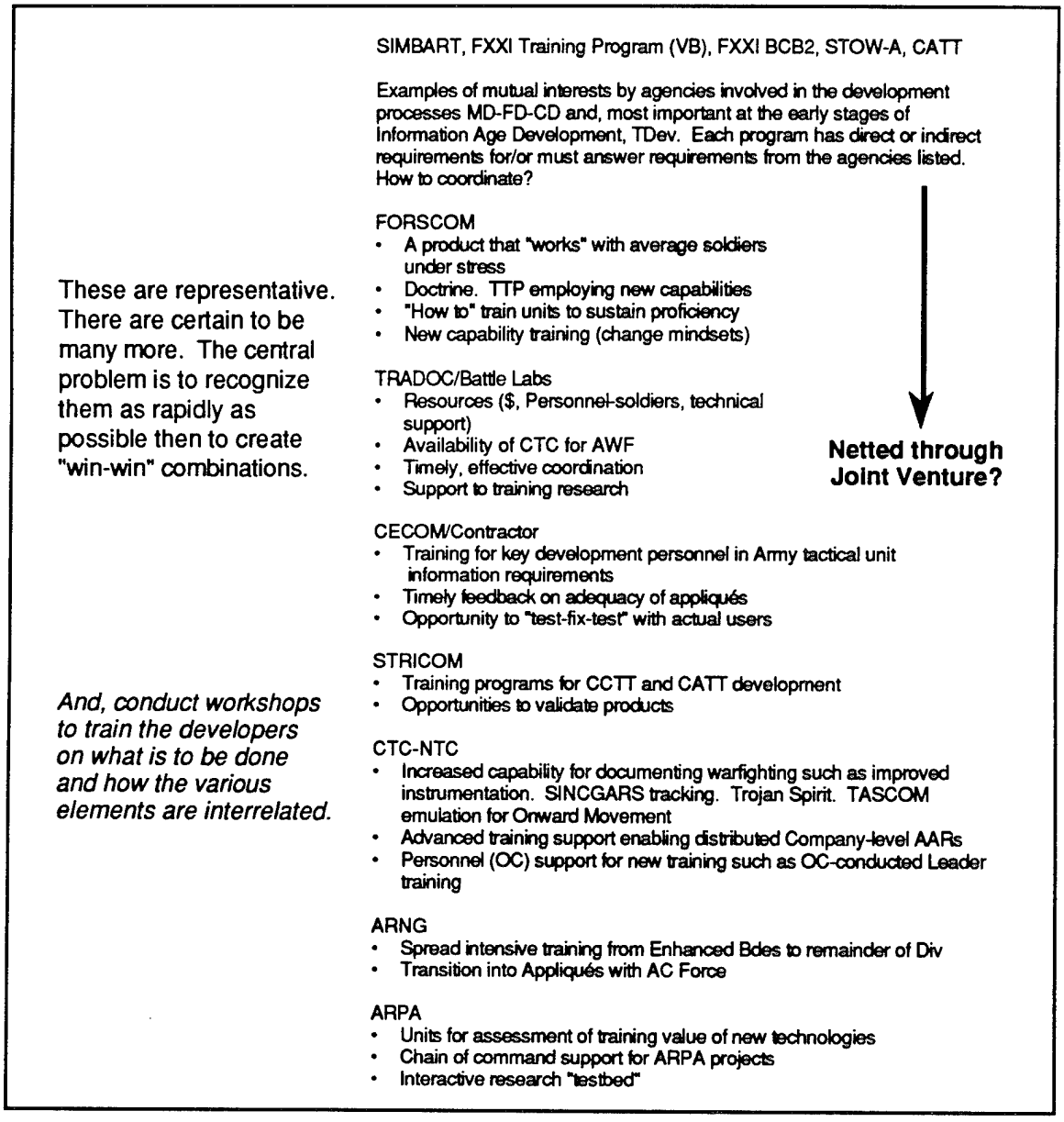

Figure IV-7. Training Development Interrelationships

And therein lies the significant potential of future training development in the Information Age. The synergies seem so numerous and so powerful that the more the power of structured training is understood, the more applications will be discovered that benefit all. Here is where the digital future, the new paradigm (see Figure IV-3), and structured training meet to provide revolutionary capabilities for Force XXI. The range of potential interrelationships between the various agencies, each with a real stake in these technologies, is so great that there are certain to be many discovered synergies.

V. CONCLUSIONS AND RECOMMENDATIONS

Presenting explicit Conclusions and Recommendations may be pretentious given the complexity of the training development challenge confronting a complex, globally committed Total Army undergoing substantial change. Yet the very complexity of change urges creation of a systemic response. It is hoped that the discussion in this paper has created two broad reactions from the reader. First, training development in the Army today is severely stressed, if not broken; there is no effective system in place to address timely training development. Second, something has to be done about correcting this deficiency, sooner rather than later.

A. CONCLUSIONS

- There is a substantial backlog of training development to be updated, while genuinely new requirements, particularly those associated with force digitization, are met.
- New training development doctrine is required to correspond to the emerging requirements of the information age.
- Existing funded programs that require improved training development can provide many of the resources needed.
- There are opportunities to take advantage of new training capabilities created since the training revolution of the seventies—distributed TES and the Combat Training Centers (CTCs).
- Systemic training development problems mandate long term strategic governance and broad involvement across major commands.

Beyond that level of specificity, it is difficult to provide action-oriented recommendations. The nature of each training problem, individual or collective, institution or unit, will determine what needs to be done to create fully effective training. Nevertheless, there are five general policy recommendations, detailed below, that should govern the design of a training development fix appropriate to the demands of the Information Age.

B. RECOMMENDATIONS

- *Initiate finite actions.* Create training development products to solve explicit, immediate, problems.

- *Update training development doctrine.* Review and revise both existing training doctrine and the largely Industrial Age practices developed in the first training "revolution" as the Army rebuilt after Vietnam.
- *"Pile on" to generate resources for training development.* Training development (trained TCS) is the glue that binds together new developments (material, force, combat).
- *Generate new Information Age training development capabilities.* New training infrastructures such as the CTCs with highly competent OCs offer new potentials for executing imaginative and timely training development.
- *Establish consistent long-term governance.* Some consistent policy and program overwatch drawing on external expertise seems appropriate at least until the Army recreates an Information Age training development system.

I recommend implementing these policies as appropriate to the training development challenge sensed at each echelon and locale.

C. DISCUSSION OF RECOMMENDATIONS

1. Initiate Finite Actions

Create training development products to solve explicit, immediate, problems rather than consume management talent to create complex long-term, and expensive, plans to recreate a traditional bureaucracy institutionalized in TRADOC. Training development is complex and is changing rapidly in response to new capabilities, particularly those associated with distributed TES. The critical decisions will be those associated with *selecting problems to be solved.* When you do not know what you do not know, pick issues likely to provide insightful answers, then move one step at a time through the high-payoff issues, prepared to change targets and expectations as you go.[1]

Earlier chapters have described a considerable current deficit in training development. Viewed in the aggregate, the gap appears unmanageable, almost of the magnitude of the challenge that existed when the requirement to define task, condition and standard loomed before the Army in the seventies. For that reason alone, design of a grand remedial program now seems undesirable. Creation and staffing of such a plan would consume valuable time and probably not be supportable within likely resource availability.

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1 This presumes "piggy back" funding, risky but certain due to the power of the technologies

A more compelling reason is that the processes of conducting training development itself are in flux. New tools are available. As described in Chapter IV, it is now possible to create "marks on the wall" in TES. Create the "mark" in whatever detail is required, then document that detail. The laborious procedures of creation of a front end analysis are becoming outdated if not dysfunctional, since they look backward, not forward, and are highly resource intensive. Given the opportunity, traditional training developers designing a grand plan would recreate an expensive Industrial Age relic. That is what they know. A current example is the Critical Combat Function development work underway by contract to ARI. Although this development is clearly a necessary effort, the research methodology is tedious at best. It employs the techniques of the seventies. At the current rate of progress, it will be years before there is a comprehensive product.

A better, more responsive, and certainly less expensive alternative is to focus training development resources on specific current force training problems. One such focusing issue is the development of battle staff training in quick combat decision-making, a very considerable training challenge in mounted battalions today. Leader Training Programs at the NTC and CMTC seek usable training policy, training development (staff tasks) and training support (JANUS scenarios). The need generates the available subject matter expertise that will be necessary to conduct the training development—in this case, CTC OCs charged to solve a pressing challenge to current training readiness.

Another issue is the development of unit training for fielding of the M1A2 tank. The M1A2 with IVIS is a training challenge analogous to what can be expected several years from now for the mounted force equipped with FBCB2, the digitized force. Test, fix, and test the M1A2 individual, team and unit training strategies as the precursor for digitization training policies and programs. SMEs are available, in the unit chain of command. Testbeds are present, the fielded unit at Fort Hood. Most important, there is intense practical unit motivation to succeed in order to maintain training readiness.

In each example, there is the potential of multiple organizations working together to solve very specific training development problems to ensure that sensible, user-helpful development is occurring. Success is clearly advantageous to a Table of Organization and Equipment (TOE) unit facing an immediate readiness problem; their support (and access to their talent) is highly likely. Trials (mini-mini AWE) can be conducted frequently to continuously improve the development.

In sum, WFXXI is a fine plan. It establishes the broad strategic vision and framework for design and development of future army training in units. The plan is there,

now the action should move to the micro-level to develop (invent) the Information Age training development policies and processes necessary to enable WFXXI at reasonable cost.[2] The final product, both policies and processes, seems certain to be quite different from current practice. Therefore, do not waste time debating elaborate plans which will change; instead, initiate specific focused actions, which can be modified as experience dictates.

2. Update Training Development Doctrine

Review and revise both existing training doctrine and the largely Industrial Age practices that were developed with the first training revolution as the Army rebuilt after Vietnam. Times have changed; revalidate the old doctrine and modify or replace it where it is no longer appropriate.

Some training development doctrine seems well out of date. Several possible changes have been discussed in earlier chapters. One of the most important doctrinal changes is to acknowledge that turbulence and turnover within units is not only inevitable; in the Information Age, it may well be desirable as long as the inevitable immediate loss in cohesion is compensated for by the pooling of extraordinary competence. Quick and absolutely decisive victory in Force Projection operations mandates highly qualified personnel concentrated in organizations composed of whatever battlefield functions may be required to absolutely dominate the METT-T of the objective area. Deployment of *ad hoc* Joint and combined Task Forces often composed after the crisis occurs is a more likely force deployment model than is the balanced Corps, Division, or Brigade Task Force consisting of balanced combat, CS, and CSS capability. If this describes the actual if not the declared national policy, the design of training in units should be modified. Preparation of highly proficient individuals becomes the primary objective of steady state peacetime training, not the preparation of ready units.[3]

In fact, there appears to be recognition of the very important leader training value of the CTC experience in both FORSCOM and USAREUR. Improvement of unit training proficiency is sought during the course of a CTC rotation; improvement of individual leader proficiency (E5 and above) is mandatory. This is reasonable since units are composed for

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2 The "circle" diagrams in Chapter IV indicate the growth potential in exploiting training development synergies among various current programs.

3 With an obvious caveat for highly ready forced entry forces and their immediate backup drawing pre-positioned equipment.

this important training experience, then practically reorganized upon completion.[4] It is what is actually happening, for necessary and understandable reasons; training policy and training development doctrine need to be changed to reflect this post Cold War reality.[5]

A second major modification of training doctrine appears likely due to the capabilities of distributed TES. For the first time, individual and collective training can be distributed with very rigorous quality control. That is the message of structuring training—the tables/modules discussed throughout this paper. The focal point of training seems certain to become the unit. That is, the unit trains individuals, teams and units to achieve and sustain likely mission training proficiency. Turbulence and turnover are endemic, until the unit is frozen in pre-deployment marshaling. Unit training must be designed to handle both situations. Initial entry forces will have to be sustained at very high readiness levels. For the rest, intensive training would be prepared for use during marshaling, very similar to training designed for the RC post-mobilization. In this model, TRADOC trains only that which the units cannot—probably initial entry training (socialization) for officers and enlisted personnel.[6] TRADOC would be also responsible for creating the highly structured training in the basics that would be exported to the force in distributed TES, an extension to unit training of the current "school without walls" policy. This methodology would also support TRADOC transmission of new doctrine, tactics, techniques and procedures to the field army. The new would be embedded in the "a ways" of exported structured training. In effect, institutional training would be based on that which cannot be conducted in the unit, not the reverse, which is all too often the case today.

The complexity of the current and future battlefield is such that definition of task, condition and standard expressed in a Mission Training Plan is no longer sufficient to train the force. The third major change in training doctrine is the recognition that some form of demonstration is essential to effective training. This is true whether training mounted or dismounted platoons or training staff officers in the TCS of control.[7] For the first time,

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4 Under strength units currently training at CTCs reinforce the individual over unit focus of the training. It is clear that units would be filled to deploy.

5 For an example of how this change might modify the design of an NTC rotation, see the discussion in Chapter III.

6 TRADOC would remain responsible for educating the officer and noncommissioned officer corps. That cannot and should not be exported. Note, however, that TRADOC currently has a very capable corps of trainers (instructors) conducting intensive individual and collective training in units. They are the OCs at the CTCs including BCTP. Lines of responsibility become blurred.

7 This is probably also true for educating commanders in the art of battle command but that is yet to be proven.

this can be done with absolute quality control in effective virtual simulation—a significant national advantage.

A fourth change in training doctrine is reflected in the first policy proposal suggested above: tie training development in TES to the interactive spiral development cycle currently used in material development. That is the strategy of development for the CCTT. It seems applicable in many other areas, particularly those associated with digitization of the force where test, fix, and test between user and developer appear essential. The same methodology seems appropriate to practically all training development.

A new formulation is required which would guide management organization and decisions concerning training. Training activities should be divided into determining *training policy*, conducting *training development,* then creating the *training support* necessary to implement the policy. The point is this: do not begin training development until you know the training policies to be supported; do not produce training support until the training development has been completed, and you know what TCS the new capability must support. Each of these functions must be performed in a certain sequence if there is to be effective Army training development.

3. "Pile On" to Generate Resources for Training Development

Training development (trained TCS) is the glue that binds new developments (material, force, combat). Tie the completion of training development to existing, funded spiral development models. To generate funding and manpower resources, draw on the value-added which successful training development can provide to unit readiness. Seek new training development "allies," particularly those with resources.

The message here is simple: do not waste time trying to originate major new funding programs.[8] As discussed in Chapter IV, TCS embedded in structured training (highly detailed "a ways") is the new coin of the realm for the material developer, the force developer, and the combat developer in the Information Age. TCS focused in time and space are the blueprints, the functional descriptions, for Information Age development. Therefore, it is to the advantage of every developer to work closely with the training developer.[9]

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8 The point is don't expend valuable (and scarce) energy originating; tie resources to building on successful previous efforts.

9 This is not widely understood—a major challenge in conversion to Information Age development processes for the Army at large.

The diagrams at the end of Chapter IV portray important funded programs which should fund training development. Focus Dispatch applies SIMUTA to digitization as part of a continuing AWE schedule leading to TFXXI. Transition from SIMBART to SIMDART and SIMCART develops the baseline vertical TCS, which become the functional description for ensuring that the Army Battle Command System links vertically and horizontally with FBCB2. Export of SIMUTA to USAREUR linked to the BLTM and SATS-TREDS (Training Exercise Development System) validated major elements of the WFXXI training management system, which is clearly of great interest to DAMO-TR in allocating OPTEMPO resources for training. Export of BCST to Iowa ARNG for use in distributed institutional training and distributed unit training—staff training in the TCS of control in the 34th Brigade—is clearly advantageous to both Warrior XXI for TRADOC and for the future training readiness of the ARNG.

To double and triple the effectiveness and efficiency of training in units, a basic development strategy, which was laid out in 1990, would accomplish the mission by compression, distribution, modernization and total quality management (TQM) (including task prioritization) of training processes.[10] Compression advocated the design of new structured training exercises (tables and modules to train basic TCS followed by STX for more advanced training). Distribution envisaged the distribution of DIS to distributed units on the DSI. Modernization called for extensive use of lower cost TES. TQM and prioritization sought the narrowing of the training requirement to basic high-value missions—now defined as DATK, MTC and DIS as embedded in SIMUTA (soon SIMBART)—then rigorous assessment of performance in timely AARs.

This training development effort is designed to support a multitude of force training requirements which could be expected to fund some or all of the actual development effort. There is a direct tie to OPTEMPO justification in the application of structured training to the BLTM. Ties to Operational Readiness (OPRED) determination seem inevitable. Effectiveness and efficiencies associated with compression, distribution, prioritization and modernization are as applicable to joint training (STOW) as they are to Army Title 10 training.

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10 Doubling or tripling both effectiveness and efficiency of training in units is not a pipe dream. See Enclosure 4, an extract from a paper the author prepared for a recent Army War College–Recruiting Command Conference, *Army 2010*, dealing with potential gaps between Army personnel demand and accession supply.

4. Generate New Information Age Training Development Capabilities

Recreating old training development organizations is neither feasible (too costly) nor desirable. New technologies applied to new, often unanticipated problems warrant changing organizational structures. Employ virtual organizations. New training infrastructures such as the CTCs with highly competent OCs offer potential for executing imaginative and timely training development. Unencumbered by a resistant Industrial Age bureaucracy, there is a significant opportunity to create new Information Age capability where change is expected and sought, not feared.

However resources are generated to support the intensified training development that is necessary, it is apparent that new capabilities will be required. Fortunately, they are available. The most significant is the extraordinary training development potential of the CTCs. It would be difficult to imagine a more desirable combination of capabilities. Well-qualified officers and sergeants (OCs) are highly motivated to master the warfighting detail of their specialties as they mentor their peers, who themselves are immersed in an extremely intense warfighting environment.[11]

The AARs are only one facet of the very detailed professional dialog that goes on between OCs and unit leaders practically 24 hours a day in the best quasi-combat environment conceivable. Add to this the reflective judgments of the senior leadership of Corps and Divisions present to observe training at the CTCs and you have, monthly, extraordinarily informed professional discussion and considered reflection. Last year, it was proven to the satisfaction of the TOE unit chain of command that the CTCs could be used for developmental purposes without detracting significantly from the basic combat training purpose of the CTC.[12]

The cues for intensive training—and reflective education in battle command—are superb. The inventory of cues that can be presented to stimulate player unit actions is practically unlimited if the combined capabilities of the NTC, JRTC, CMTC, and BCTP are considered.

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11 There is an important insight here. OCs aren't "giants." They are above-average officers and NCOs placed in an extremely positive training environment—intense repetitive immersion in very detailed warfighting. They attain genuine mastery of tactical proficiency in several months. This is a tactical SAMS. How does the Army exploit this mastery in subsequent assignments?

12 Comments, HotWash Desert Hammer NTC Rotation 94-07, April 1994.

Lastly, increasingly detailed instrumentation systems permit detailed measurement of individual, team, and small unit action to a degree that just several years ago would have been associated with the most demanding developmental test and evaluation plan.

I have had the opportunity to observe this premier training development capability in action twice during the past several months. First was the development of TCS for OOTW at the CMTC. As discussed in Chapter IV, faced with a contingency requirement to be prepared for commitment to OOTW (former Yugoslavia), the 7ATC/CMTC did an absolutely superb job of training development.[13] They researched the experience of other nations then, in conjunction with the TOE unit involved, developed through test, fix, and test experiential trials (spiral development) a very effective structured training program to prepare brigade and battalion size organizations for peacekeeping deployments.[14] The resultant training is so effective that other nations now pay to have their units undergo this training before participating in peacekeeping operations.

The second example is the development and training of ROM doctrine, tactics, techniques, and procedures at the NTC. A highly detailed analog model of a prepo equipment draw was created, then the OCs and the unit in training worked together to develop highly detailed TTP. Each Division in training at the NTC will go through this highly realistic Force Projection structured training situation with all of the NTC's observational and analytical assets focused on developing effective TTP. In due time, this superb effort will be documented in formal Army publications.

It seems clear that as TRADOC capability has been drawn down, the center of gravity for training development has moved to the CTCs. And the CTC potential is just beginning to be tasked. To be sure, all agree that the current OCs are very busy, but, in terms of drawing on the extraordinary insights of highly competent professionals immersed nearly continuously in a quasi-combat environment, much more can be done. A recent Chief, Operations Group NTC, estimated that about 30 percent of the expertise potential of the OCs is being realized.[15] Even if he is only half correct, there is significant capability as yet untapped. OC productivity increases will require additional resources in the form of

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13 Other equally fine work was done in support of STOW-E, in this case demonstrating the applicability of CTC in support of Force XXI training development, as the NTC demonstrated in Desert Hammer.

14 Comparable training development has been done at the JRTC for peace enforcement operations and recently for peacekeeping operations in Haiti.

15 BG O'Neal, *A Proposal for the Future of Our CTCs*, Hqs III Corps, 1994.

information systems support and knowledgeable personnel to record their observations. This is a modest investment for a great return.

There is even more capability here than first meets the eye. The synergism possible when the expertise and energies of the tactical units are added to that of the OCs is enormous. Increasingly, incoming commanders and staff officers "ride with the OCs" to observe, comment, and learn in this immersion environment. "Sidebar" conversations in the community of observers are highly stimulating. Now this is all about to be intensified by improvements in the various Leader Training Programs when commanders and staffs come to the CTCs for intensive structured training several months before their actual CTC rotation.

5. Establish Consistent Long-Term Governance

Training development is complex, but Army management for training development in units is transitory as chains of command change due to necessary turnover. Further, there is limited training development expertise in uniform. Some consistent policy and program oversight is appropriate until the Army recreates it for training development.

Training development is a very complex problem, particularly during a period of major change such as from Industrial to Information Age. The turbulence and turnover of personnel has been a major impediment to effecting many of the changes proposed. Not that there has been any substantial opposition; rather, it is an issue of very busy leadership requiring time to become sufficiently aware of the issues to make confident decisions. Change of leadership is good, and new perspectives based on experience in addressing the many new issues facing the Army are vital. Normally, the impact of uniformed turnover is moderated by skilled Department of the Army Civilians (DAC). That DAC "core memory" no longer exists.[16] Thus there is no enduring senior governance, no reservoir of competent long-term perspective to counsel current leadership with respect to training development issues. Such governance needs to be established, perhaps as an advisory sub-panel of the Army Science Board or similar agency, under the direction of a former Chief of Staff Army (CSA) or CINC.

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[16] There is substantial training development expertise remaining in the training side of ARI. ARI field units have made major contributions to such development as has been done. ARI Knox has been the core of research in digitization. This capability needs to be reinforced. But ARI has highly competent technicians focused on research. Operators are also required. This perspective was available in the old Training Development Institute (TDI) of TRADOC, long disbanded.

For both educating and training officers, the Land Warfare University is alive and very healthy today in the CTCs as an amalgam of the interest and resources of TRADOC and tactical commanders. In effect, the extraordinary warfighting training and education capability of the CTCs has already moved the premier locale of officer preparation to a consortium of TRADOC proponent and tactical units on the ground at the CTCs. A new, highly effective, virtual organization has been created.[17]

This virtual organization, expanding and contracting depending on the expertise required to serve various development needs, is the key to generating new training development capabilities. The composition of the virtual organization would vary depending on the area of development. The locus of development would be whichever CTC is appropriate to the problem being addressed. The team would consist of whatever TRADOC organization has proponent responsibility to develop doctrine, organization, training, leadership, material, systems (DOTLMS) for the area under development. Much of the work force would be provided by temporary personnel, in most cases highly respected former OCs selected based on their demonstrated expertise and hired for the duration of the training development project underway.[18]

Management overhead for training development should be kept to an absolute minimum. The larger the organization, the more plans will be generated to justify its existence. There is a very substantial bureaucracy present already, particularly at Leavenworth. But genuine issues of prioritization and resource allocation will arise among and between Army Major Commands and will require adjudication at Department of the Army echelon—not to exclude a broad range of Joint and combined interests that will need to be recognized. Several decades ago, Major Army Command (MACOM) representation in training development was ensured by the Army Training Board, a TRADOC entity chartered by Army Regulation to represent the interests of MACOM commanders. Something similar to this could be recreated; however, due to the much closer working relationships between MACOM, it would seem best to have this coordinating capability at Department of the Army level.

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17 I have been singularly impressed by the apparent absence of "turf" issues between FORSCOM and TRADOC at the NTC or JRTC or between TRADOC and USAREUR at the CMTC. Multi-command "teams" are doing a great job.

18 There is a deeper issue here. That is that the CTC and TES offer an immediately available capability to assess and reward tactical competence and innovation that would be the envy of the most aggressive corporations in U.S. industry.

The bottom line: more training development capability is clearly required. Approached from an Industrial Age perspective, we would say there is an enormous resource bill, including re-creation of an unaffordable training development bureaucracy. If existent capability (CTC+ as described) and virtual organizations supported by former OC temporary personnel are used, the primary cost should be the actual dollars required to do the work. Even in this important area of resources, as discussed above, there are a number of major ongoing, funded efforts that must have the TCS training development to accomplish their Information Age tasks. They should fund the development. Orchestration of all aspects could be done by a renewed Army Training Board under DAMO-TR.[19]

In sum, there are no quick fixes to this substantial problem; however, initiating the recommendations detailed above should prepare the Army to meet the demands and challenges placed upon it by dwindling personnel and materiel resources. Exploiting the technology of the Information Age to further training development will enable the Army to fulfill the vision embodied in Warfighter XXI.

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19 Recent fine examples of competent orchestration are War Fighter XXI by CAC and the integrated plan for the FXXI Training Program prepared at Fort Knox.

GLOSSARY

AAR	After Action Review
ABCS	Army Battle Command System
AC	Active Component
ADA	Air Defense Artillery
AFQT	Armed Forces Qualification Test
AFV	Armored Fighting Vehicle
ALB	AirLand Battle
AMC/STRICOM	Army Materiel Command/Simulation, Training and Instrumentation Command
ARI	Army Research Institute
ARNG	Army Reserve National Guard
ASAS	All Source Assessment System
ATB	Army Training Board
AWE	Army Warfighting Experiment
BBS	Brigade/Battalion Simulation
BCB2	Battle Command Brigade and Below
BCST	Battle Command/Staff Training
BCTP	Battle Command Training Program
BLTM	Battalion Level Training Model
BOS	Battlefield Operating System
C&GSC	Command and General Staff College
CALFEX	Combined Arms Live Fire Exercise
CAS3	Combined Arms and Services Staff School
CATS	Combined Arms Training Strategy
CBS	Corps Battle Simulation
CCF	Critical Combat Functions
CCTT	Close Combat Tactical Trainer
CCTT/CATT	Close Combat Tactical Trainer/Combined Arms Tactical Trainer
CECOM	Communications Electronics Command
CINC	Commander in Chief
CJTF or CTF	Combined Joint Task Force
CMTC	Combat Maneuver Training Center
COFT	Conduct of Fire-Trainer
COG	Chief, Operations Group

COLT	Combat Observer/Lasing Team
CS	Combat Support
CSA	Chief of Staff Army
CSS	Combat Support Service
CTC	Combat Training Center
CTF	Combined Joint Task Force
DAC	Department of the Army Civilians
DAMO–TR	Department of the Army Military Operations–Training
DATK	Deliberate Attack
DIS	Distributed Interactive Simulation
DOTLMS	Doctrine, Organization, Training, Leadership, Material, Systems
DSI	Defense Simulation Internet
EAD	Echelons Above Division
EUCOM	European Command
EXFOR	Experimental Force
FBCB2	Force XXI Battle Command Brigade and Below
FIST	Fire Support Team
FLE	Forward Logistic Element
FORSCOM	U.S. Army Forces Command
FSO	Fire Support Officer
FSCOORD	Fire Support Coordinator
GAO	General Accounting Office
IEW	Intelligence/Electronic Warfare
IOTE	Initial Operational Test and Evaluation
ISB	Intermediate Support Base
IVIS	InterVehicular Information System
JAAT	Joint Air Attack
JANUS	Joint Analog Numeric System
JRTC	Joint Readiness Training Center
JSEAD	Joint Suppression of Enemy Air Defense
JTF	Joint Task Force
LAM	Louisiana Maneuvers
LTA	Local Training Area

MACOM	Major Army Command
MANPRINT	Manpower and Personnel Integration
MCS	Maneuver Control System
METL	Mission Essential Task List
METT–T	Mission, Enemy, Troops, Terrain, and Time
MILES	Multiple Integrated Laser Engagement System
MLRS	Multiple Launch Rocket System
MOE	Measures of Effectiveness
MOOTW	Military Operations Other Than War
MOP	Measures of Performance
MOS	Military Occupational Specialty
MPRC	Multi-Purpose Range Complexes
MTA	Major Training Area
MTP	Mission Training Program
NTC	National Training Center
OC	Observer/Controller
OOTW	Operations Other Than War
OPFOR	Operational Force
OPRED	Operational Readiness
OPTEMPO	Operations Tempo
PGT	Platoon Gunnery Trainer
PM	Program Manager
POI	Program of Instruction
RC	Reserve Component
RCVTP	Reserve Component Virtual Training Program
ROM	Reception, Onward Movement
RPG	Rocket-Propelled Grenade
S-2	Battalion Intelligence Officer
S-3	Battalion Operations and Training Officer
SAMS	School of Advanced Military Studies
SATS	Standard Army Training System
SIMBART	Simulation-Based Mounted Brigade Training Program
SIMCART	Simulation-Based Mounted Corps Training Program
SIMDART	Simulation-Based Mounted Division Training Program
SIMITAR	Simulation-Based Multiechelon Training Program for Armot Units
SIMNET	Simulator Networking
SIMNET–CCTT	Simulated Network/Close Combat Tactical Trainer

SIMUTA	Simulation-Based Multi-Echelon Training Program for Armor Units
SME	Subject Matter Expert
SRC	Standard Reporting Code
STAARS	Standard Army After Action Review System
STOW	Synthetic Theater of War
STRICOM	Simulation, Training and Instrumentation Command
STX	Simulated Training Exercises
TACFIRE	Tactical Fire Direction System
TADSS	Training Aids, Devices, Simulations and Simulators
TCGST	Tank Crewman Gunnery Skills Test
TCS	Task, Condition, Standard
TDI	Training Development Institute
TES	Tactical Engagement Simulation
TF	Task Force
TOE	Table of Organization and Equipment
TQM	Total Quality Management
TRADOC	U.S. Army Training and Doctrine Command
TREDS	Training Exercise Development System
TSP	Training Support Package
TTP	Tactics, Techniques and Procedures
UCOFT	Unit Conduct of Fire Trainer
USAREUR	U.S. Army, Europe
ULLS	Unit Level Logistics System
WFXXI	Warfighter XXI

ENCLOSURE 1

WARFIGHTER XXI:
A VISION FOR ARMY TRAINING

Warfighter XXI

A Vision for Army Training

1 December 1994
Version 2

WARFIGHTER XXI

CONTENT

CHAPTER 1

Joint Venture (JV)

1. INTRODUCTION

With the end of the predictable environment of the cold war, the Army's focus has broadened:

- From a potential conflict in a mature and well developed theater to a broad range of Military Operations Other Than War in many undeveloped theaters.

- From a Soviet threat based force forward deployed in Europe to a Continental United States based, power projection army, prepared to fight a wide variety of threats as part of a joint or combined arms team.

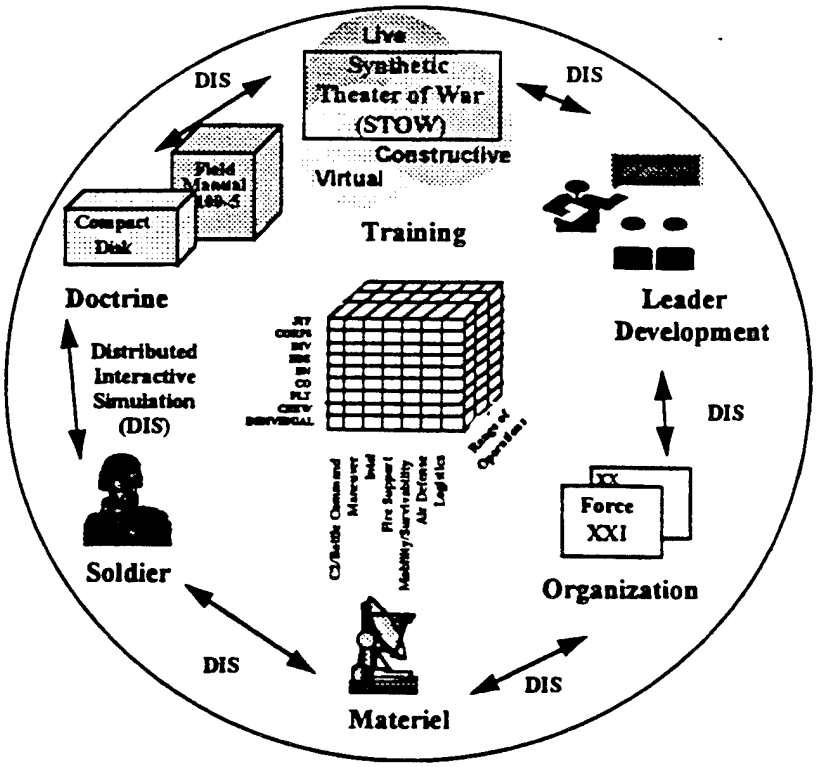
- From a resource rich environment to an austere training environment.

- From a slow, manual information environment to a high technological age with massive amounts of information flowing along the information super highway.

These fundamental changes demand we break old paradigms and old ways of thinking. Our Soviet threat based doctrine, training strategy, force development, tactics and weapon system design must adapt quickly to meet the challenges of a power projection Army. The challenges of 21st century warfare call upon us to redesign the force structure and assess how this new structure should be equipped, armed, and trained to fight tomorrow's battles. Using JV, the Army is executing a series of Advanced Warfighting Experiments (AWE) and Advanced Warfighting Demonstrations (AWD) to define the force of tomorrow: Force XXI. As we create Force XXI, we must concurrently develop the means and methods to train and sustain it. Achieving the maximum potential of Force XXI requires the Army to use the spiral development process to make early decisions based upon projected requirements and concepts still emerging. This spiral development process allows us to leverage technological improvements by continually integrating changes as we develop the force. To ensure training is included in every phase of the Force XXI development, Warfighter XXI (WF XXI) will integrate the numerous on-going initiatives and future developmental efforts to produce a coherent, integrated training system for today's and tomorrow's trained and ready power projection Army.

JV and WF XXI builds on the Army's Doctrine, Training, Leader Development, Organization, Materiel, and Soldier Systems (DTLOMS) "engine of change". DTLOMS provides the framework to identify requirements and address the impact of future

concepts on the Army. By design, DTLOMS looks across the entire range of military operations, at all echelons of command, and at all Battlefield Operating Systems (BOS). The Distributed Interactive Simulation (DIS) will soon be the foundation of the digitized battlefield. In the future, DIS will connect all of the DTLOMS elements. The JV AWE's and AWD's coupled with WF XXI are crucial to the future of the Army. Together they build tools and systems with service wide application into the 21st century. The "endstate" of JV and WFX XXI is a trained and ready Force 21.



DTLOMS "THE ARMY'S ENGINE OF CHANGE"
FORCE XXI OPERATIONS
TRADOC Pamphlet 525-5

2. MISSION

JV is the Army's plan to design and build Force XXI. WF XXI is included in JV; its focus is the development of the training strategies and systems for the future force. JV has two strategic goals:

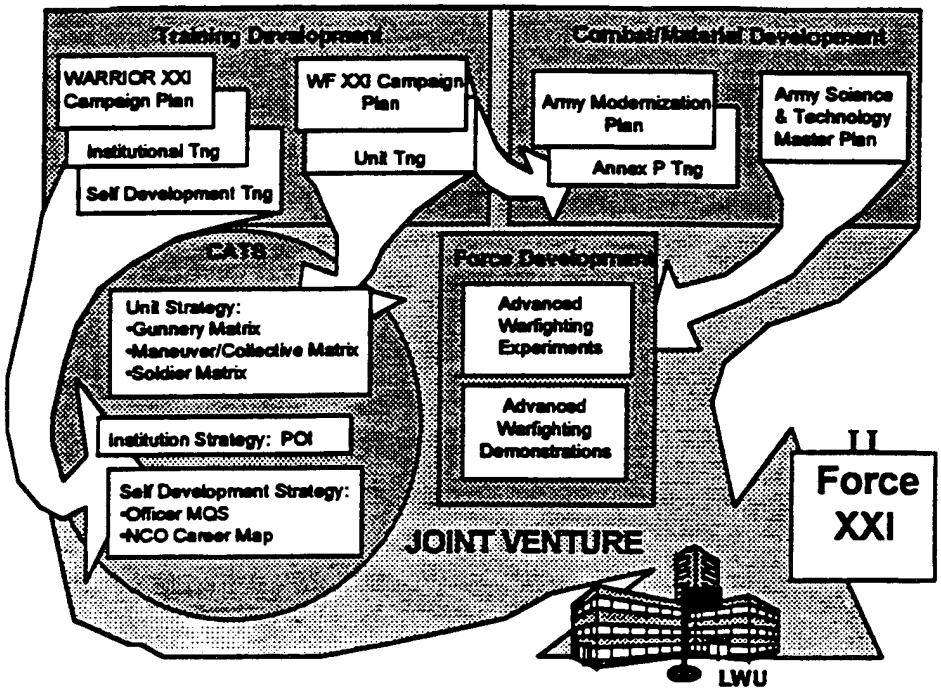
Force Development: Design Force XXI and inform the Army of implications of digitized operations in the 21st century.

Training Development: Train Force XXI and inform the Army of implications of digitized training in the 21st century.

3. CONCEPT

The following chart illustrates how WF XXI fits into the Army system. The WF XXI Campaign Plan along with the Warrior XXI Campaign Plan are a portion of the training development system of the Army. The WF XXI Campaign Plan focuses on the unit training pillar and provides a vision of how the Army will train collective tasks in the future. The WF XXI vision is included in the training annex of the Army Modernization Plan. It describes the future collective training strategies and systems to train tomorrow's Army. The Warrior XXI Campaign Plan focuses on the development of the

institutional and self development pillars of training and defines both current and future training requirements. Warrior XXI will define the requirements for TRADOC's Land Warfare University (LWU) - the future institution to support Force XXI.

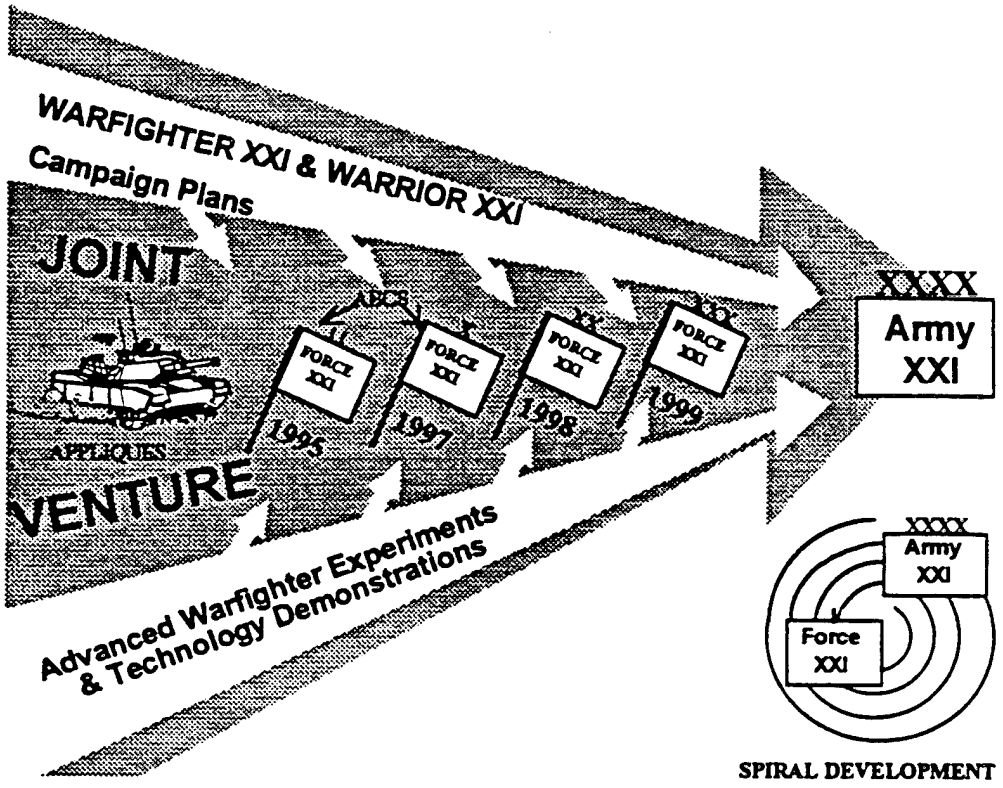


The Army Science and Technology Master Plan (ASTMP) is the Army's strategic plan for the science and technology program. The plan is based on the Army leadership's vision of the future Army, as constrained by realistic funding limits. The ASTMP serves as "top down" guidance from Headquarters, Department of the Army, to all Army science and technology organizations, and it provides a vital link between Department of Defense technology planning and the master plans of individual Army major commands, major subordinate commands, and laboratories. The ASTMP provides the vision and the funding line for many of the AWEs and AWDs.

A depiction of the interface of WF XXI with JV is included in the chart on the next page. The force training axis includes both the WF XXI Campaign Plan and the Warrior XXI Campaign Plan, to ensure all three pillars of training are addressed in building the future force. The AWD's and AWE's axis depicts the infusion tomorrow's technology into the force as described in the Army Science and Technology Master Plan.

The Army Digitization Office (ADO) is tasked to provide seamless digitial command and control capabilities throughout the future fighting force. To accomplish this task, the ADO has broken the task into three major components. The first component is production of computer based Appliques in support of Force XXI Battle Command

Brigade and Below. The second component deploys the Army Battle Command Systems (ABCS) at brigade and battalion and the third component provides capability packages introduced as an outgrowth of Advanced Technology Demonstrations. Future objectives apply this same process to division and corps level units.



4. CONCLUSION

The Army's training goal remains the same, to execute tough, realistic field training exercises as our primary means of training. However, decreasing resources, weapons system ranges and lethality, and environmental constraints are limiting our ability to train. These factors, coupled with the broad force projection mission, the need for mission rehearsal capabilities, and the digitization of future forces point out a need to leverage the rapid growth in technology to create synthetic battlefields using future Training Aids, Devices, Simulators, and Simulations (TADSS) and automated command control systems.

While it is well understood that today's TADSS are used to supplement live training, tomorrow's TADSS must provide the trainer mission rehearsal capabilities and options to train segments of the force to standard before entering into a crucial high resource or safety constrained training environment. The WF XXI vision is to build this synthetic battlefield and integrate it with today's live field training using automated

training management tools providing trainers with a flexible, Mission Essential Task List based menu of structured exercises.

One of the Army's top priorities is to "Digitizing the Battlefield" to provide seamless digital command and control capabilities throughout the fighting force. To meet this requirement, multiple initiatives are underway to harness the power of the microprocessor and information technology for our warfighters. The goal is to use digital technology to maintain a continuous edge in projecting and employing combat power on future battlefields. Mirroring this effort must also be initiatives to embed the complex, combined arms, structured training of the future into the digitized force.

CHAPTER 2

WARFIGHTER XXI (WF XXI)
"A Vision For Training the Army of the 21st Century"

1. INTRODUCTION

The Chief of Staff of the Army's vision for the Army of the 21st century:

"a total force trained and ready to fight, serving our nation at home and abroad, a strategic force capable decisive victory."

and

"As the cornerstone of readiness, training remains the Army's most important peacetime mission."

While the focus has changed, the Army's mission today remains much the same as it has been for many years. We have worldwide commitments with missions ranging from Major Regional Conflicts (MRC) to peacekeeping, peace enforcement and humanitarian assistance. Now, more than ever before, the Army operates in joint, combined or coalition environments. To carry out these operations, the need and sharing of information to command and control today's battlefield is essential to success. The impact of the surge in information age technology with its rapidly, spiralling growth is without equal in past military history. To meet these and future needs, the Army must train the soldiers of today and tomorrow on how to survive on an ever increasing lethal, digital battlefield.

The Mission...

- **World-wide Commitments**
- **Range of Operations**
  - **Major Regional Conflict**
  - **Peacekeeping / Peace Enforcement**
  - **Humanitarian Assistance**
- **Joint Environment**
- **Combined / Coalition Operations**
- **Information Age / Digital Battlefield**

entire spectrum of Army training programs and provides a strategy to integrate ongoing initiatives into a coherent, integrated training system. To accomplish these goals, the commander of Training and Doctrine Command (TRADOC) directed development of the WF XXI campaign plan in conjunction with the Army's Joint Venture (JV) plan.

2. MISSION

The mission of WF XXI is to describe a training strategy for crew through Joint Task Force (JTF) level using the best combination of live, virtual and constructive simulations and simulators. Implied tasks include:

- Task organize an executive board and advisory council to direct and review all WF XXI activities.

- Develop a campaign plan establishing guidelines for WF XXI.

- Ensure all leader development pillars are included in the campaign plan.

- Ensure Training Aids, Devices, Simulators and Simulations (TADSS) enhance and/or supplement live training events.

- Automate Army training IAW FM 25-100, Training the Force and FM 25-101, Battle Focused Training.

3. CONCEPT

The WF XXI strategy is based on assumptions supporting Force XXI objectives. These assumptions are:

- WF XXI will apply to the total Army, both Active and Reserve Components (AC/RC). Army training standards will be the same for the AC and the RC.

- Collective training requirements determine institution and self development training. The focus of WF XXI is on unit training. However, the concept fully integrates and guides institution and self development training.

- Future resources will continue to be constrained. Investments in training must be methodical and incremental, there are no resources for redundant development or experimentation.

- The lessons learned and capabilities of existing technology must be shared by all to fully exploit the Army's training investments.

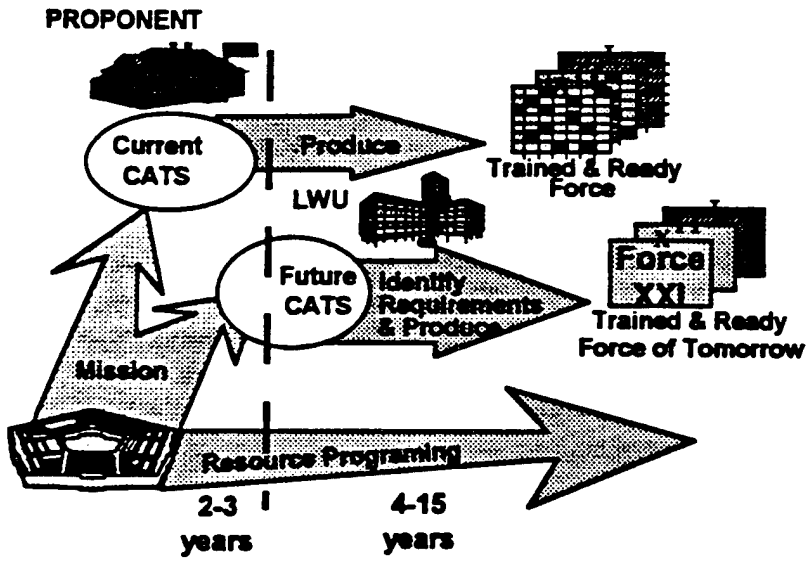
all to fully exploit the Army's training investments.

- Even though not all technologies are known, future technologies and capabilities must be exploited for use by all. We must manage the continual ongoing change of the information age to achieve the best training for the force.

To achieve the WF XXI vision, we must: (a) define a structured training development system to assist in the planning, execution, and assessment of training development, (b) identify the three pillars of training, (c) identify the five components of training, (d) integrate the three pillars and five components of training into a system, and (e) assign responsibility in a plan for the future development of Army training.

a. Define a structured training development system.

The Combined Arms Training Strategies (CATS) are the foundation of the structured training development for WF XXI. As the Army's over arching training architecture, CATS are the framework for establishing Army training. Current CATS provide doctrine based training strategies including events, gates, and training resource options for the institution or unit trainer and integrates training vertically among levels of a type unit and horizontally across the combined arms and services team. Future CATS guide training, combat, and material developers in development of future combat equipment and combat systems to support Force XXI and the Land Warfare University (LWU).



In the future, CATS will be the foundation used by the Standard Army Training System (SATS). CATS will assist both AC and RC trainers in designing training programs, determining unit readiness, mobilization planning and developing training budgets.

CATS provides direction on how the Army trains the force. It provides standardized training requirements and resources to execute the training. Under the purview of the CATS, proponent LWU schools develop unit training strategies for tactical units at Corps level and below. These strategies propose the frequency of

annual training events to achieve desired levels of proficiency and readiness to accomplish battle-focused METL requirements. The proposals are prepared as matrices of training event menus correlated with unit levels and critical training gates. The matrices also identify the training resources (e.g., Combat and land, and Training Aids, Devices, Simulators and Simulations (TADSS), including Tactical Engagement Simulations (TES) Training Systems Devices) required to support each proposed training event. Current CATS are governed by AR 350-41 Training in Units, TRADOC REG 350-35 The Combined Arms Training Strategy, and TRADOC PAM350-10 Combined Arms Training Strategy Development.

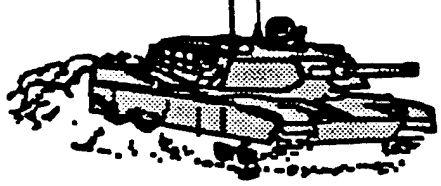
Today's training strategies, and funding trails, are based on input from each school-house proponent. CATS are supported by a training resource management system consisting of master and modernization plans for major training resources (e.g., Tactical Engagement System-Master Plan (TES-MP) training system, range modernization, and Combat Training Centers (CTC) master plans). Master plans such as the TES-MP, define the current baseline and forecast future resource requirements, while modernization plans align training resource requirements contained in the proponent developed future CATS with available resources. Current CATS reflect the baseline and apply to the execution, budget, and program years. Future strategies are influenced by projected threats, operational missions, weapons and training technologies, and budgetary guidelines.

b. Identify the three pillars of training.

CATS support the three mutually supporting pillars of training: unit, institution, and self development. Unit training, outlined in the WF XXI Campaign Plan, reflects the collective training effort and captures all of the institutional and self development training as supportive of the collective training task. Future institution and self-development training effort is outlined in the WARRIOR XXI Plan.

Units

- **Soldiers**
- **Maneuver / Collective**
- **Gunnery**



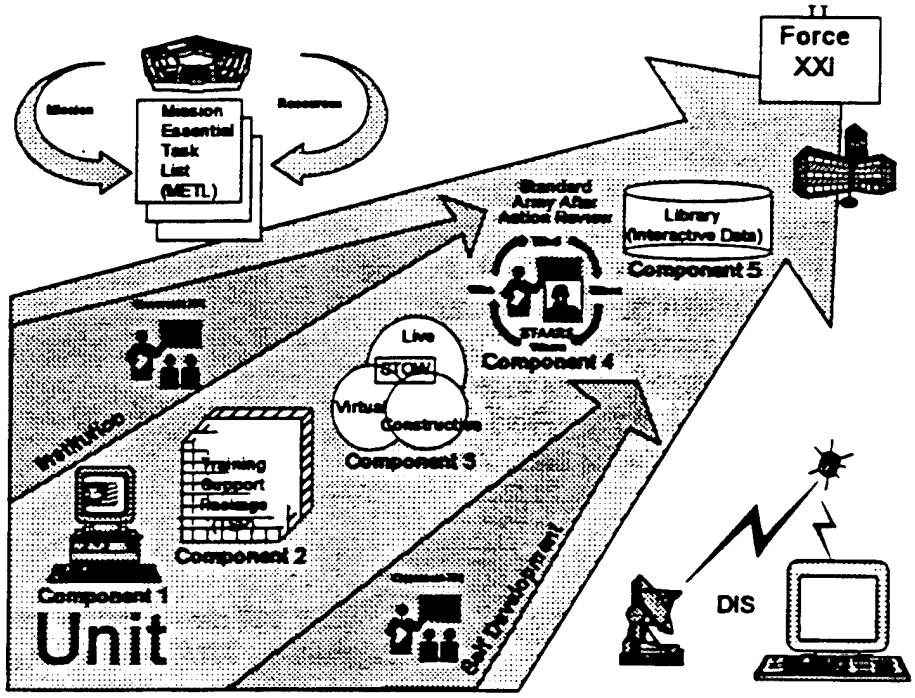
Unit training strategies are prepared by proponents in the form of current CATS describing how Table of Organization and Equipment (TO&E) units train and identify those resources required to execute the training. The strategies depict a fully supported annual training plan enabling a unit to maintain required combat readiness. The strategies consist of a soldiers matrix, a maneuver or collective matrix (depending on the type unit) and a gunnery matrix. The strategies are descriptive in nature and provide the foundation for the trainer to develop a training program.

The institutional pillars are developed by the proponent schools and define the requirements for training soldiers to standard in resident course instruction. These Army courses span the gap from initial entry training of a new recruit to the Army War College for the Army's senior leaders. Training at all levels focuses on the individuals development of basic skills and the development of future leaders. The institutional pillar is connected to CATS by the proponent based training requirements or training strategies being directly reflected in the Programs Of Instruction (POI) of each Army school.

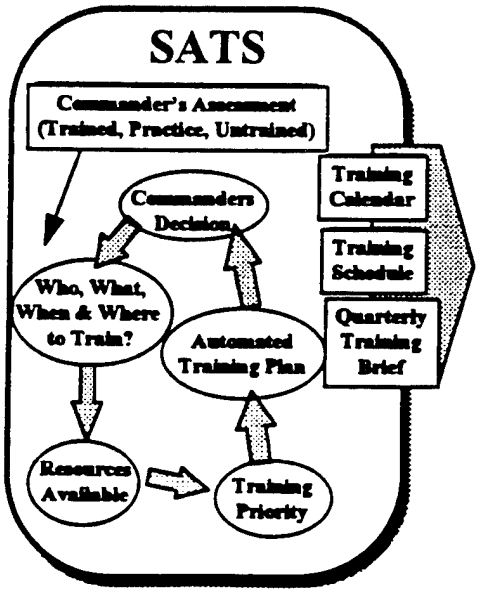
The self development strategies are designed by TRADOC through its proponent schools. The strategies provide the soldier with a road map to improve his skills. Currently, the Officer Foundation System (OFS) serves as the officers self development CATS for individual development and the Noncommissioned Officer (NCO) self development career map serves as the NCO self development CATS.

c. Identify the five components of training.

The five components of the WF XXI Campaign plan are: the Standard Army Training System (SATS); Training Support Packages (TSP); Training Aids, Devices, Simulators and Simulations (TADSS); Standard Army After Action Review System (STAARS) and the library.



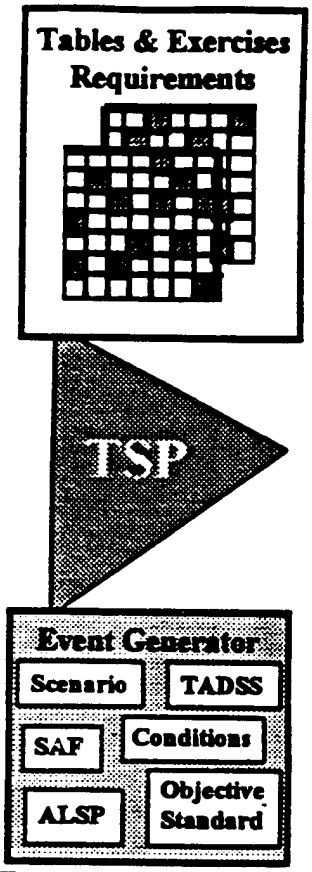
INTEGRATION OF THE THREE TRAINING PILLARS AND THE FIVE WF XXI COMPONENTS OF TRAINING



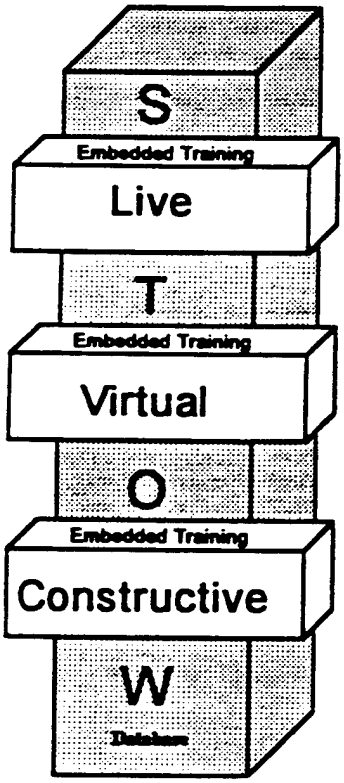
THE STANDARD ARMY TRAINING SYSTEM

SATS, the "center of gravity" of WF XXI, is the trainers management tool to provide a "unit specific" situational training template and aid in the management of training resources. SATS implements the Army training policy described in Field Manual, 25-100, Battle Focused Training and is based on CATS as described in TRADOC Regulation 350-35, The Combined Arms Training Strategy. SATS is designed to save the trainer time and manpower and offers both structured and descriptive training guidance. Additionally, SATS provides the training resource manager a tool to capture usage and cost of training resources for use in budgeting, management and programming of training resources.

TSPs are doctrinal training templates offering the trainer a total training package to execute training to achieve specific training objectives as spelled out in Army Regulation 350-38, Training Device Policy and Management. The TSP combines maneuver/collective gunnery and soldier CATS matrixes (tables and exercises) to produce a unit situational training template. An event generator uses the situational event template data to provide scenarios, conditions, standards and semi-automated forces to support training events in one environment or a combination of the live, virtual, or constructive training environments. The TSP couples the training event template with actual training exercises to provide the trainer with a series of progressive performance oriented exercises (crawl, walk, and run theory) designed to gradually increase task proficiency. TSP's by design give the trainer a tool to maximize the use of all training resources for unit training.

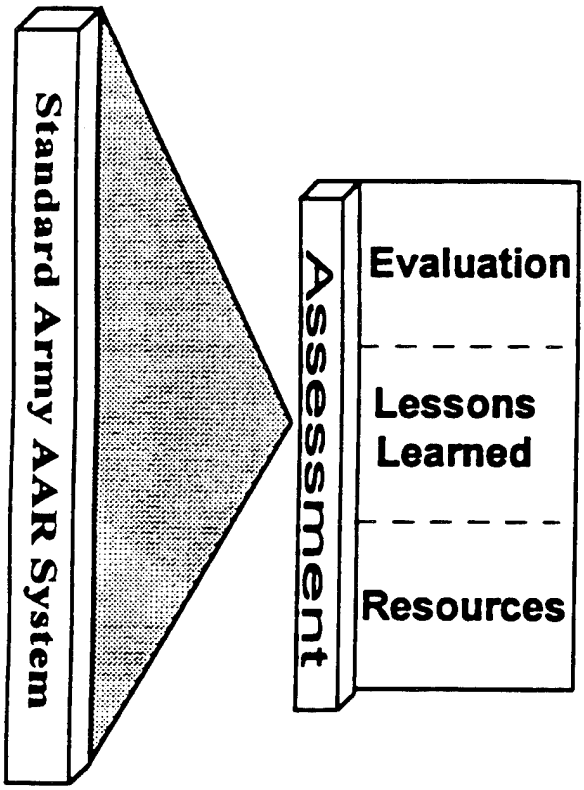


TRAINING SUPPORT PACKAGES



TRAINING AIDS, DEVICES, SIMULATORS AND SIMULATIONS

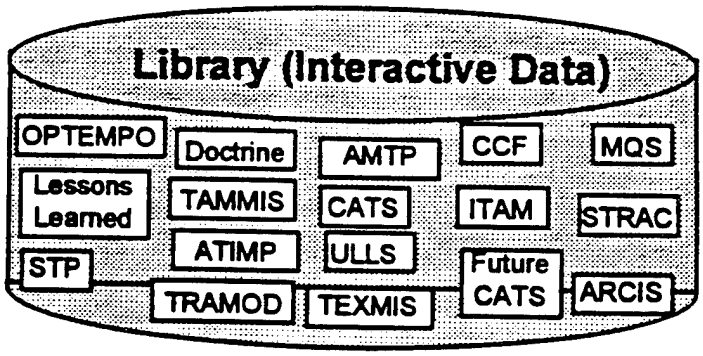
TADSS offer the trainer a selection of training tools to offset the financial, safety, environmental/ecological, and technological constraints associated with today and tomorrow's training. TADSS are broken into three general categories; live, virtual, and constructive. In the near future, the Synthetic Theater Of War (STOW) will link all three environments for training and mission rehearsals. In the future, TADSS will be DIS compliant, use standard terrain, enemy, and icon data bases; be fully embedded in equipment and systems; and be fully integrated into the total Army system.



STANDARD ARMY AFTER ACTION REVIEW SYSTEM

STAARS standardizes all current and future after action review systems to provide the trainer, training developer, and combat developer with DTLOMS based information and feedback on performance of systems, students, and units. It also provides the training resource manager with usage rates and operating costs of all training resources. In the future, STAARS will automate the lessons learned system to provide all soldiers and units access to lessons learned from the CTCs, on going Military Operations Other Than War (MOOTW), and/or combat operations. The data from current STAARS systems provided from the live, virtual, and constructive environments, must standardized and synchronized to provide universal assessment of today's training proficiency, unit readiness, lessons learned and resource management. Future STAARS will use DSI as the Army's information highway to feed information to the library, for users to access.

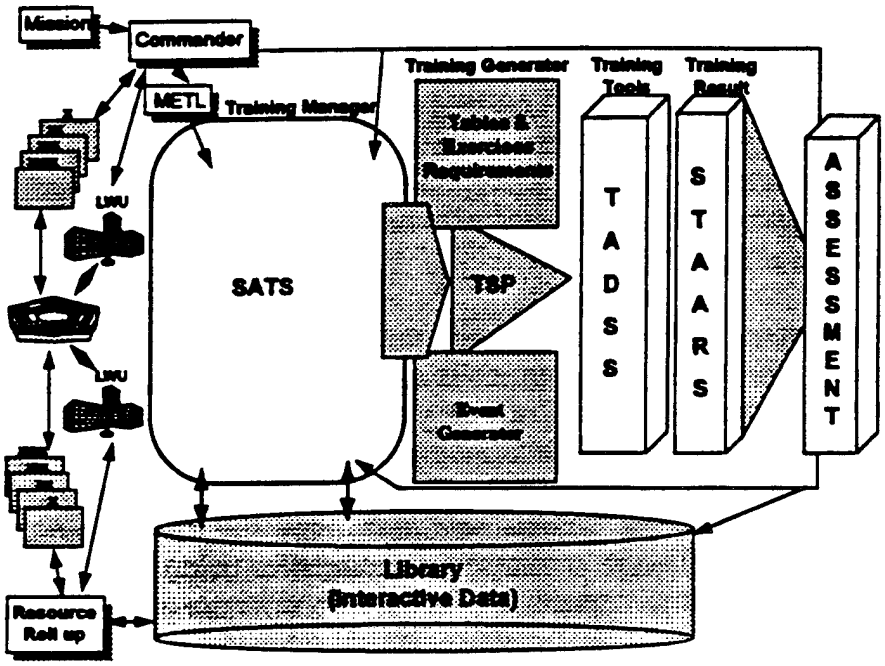
The **library** is the information foundation of WF XXI and is a repository of all training related information. The library will use the Army Training Information Management Program (ATIMP) as the interactive electronic "library without walls" for trainers, training developers, combat developers and resource managers. Within the ATIMP, the TRADOC Executive Management Information System (TEXMIS) will have both internal and external digitized access to training information and other army system information supporting or relating to training. Doctrine, ARTEP's, STP's, OFS, CATS and etc., coupled to unit logistic and personnel information, will be the future foundation of information for the SATS data base.



LIBRARY

d. Integrate the three pillars and five components of training into a system.

When integrated with the three pillars of training and the structured training development system, the five components of WF XXI form a total, self sustaining , automated, training management system. The trainer of the future will use an integrated training management support system to help optimize available training resources as he plans, prepares, and assesses the execution of this training.



THE FUTURE TRAINING MANAGEMENT SYSTEM

Like today, the trainer of the future will derive a training plan from an assessment of the unit's training proficiency on its Mission Essential Task List (METL), guidance from the automated quarterly training brief, and availability of training resources. Future automated training management tools will provide the trainer the ability to integrate these products into objective oriented, structured training events. Using the training management database, available resources and the trainer's priorities, the SATS program will consider how best to train the unit and present the trainer with a selection of training program options for a decision or further prioritization. Using the resource roll up and the multi-echelon training plans generated by SATS, the trainer makes the final adjustments to his training program before SATS publishes a training calender and locks in the required training resources.

In designeing the unit training program, SATS uses CATS and an automated task database stored in the library based on unit Mission Training Plans (MTP) to integrate horizontally and vertically across the Battlefield Operating Systems (BOS). This database provides a complete directory of critical combat functions for integration into

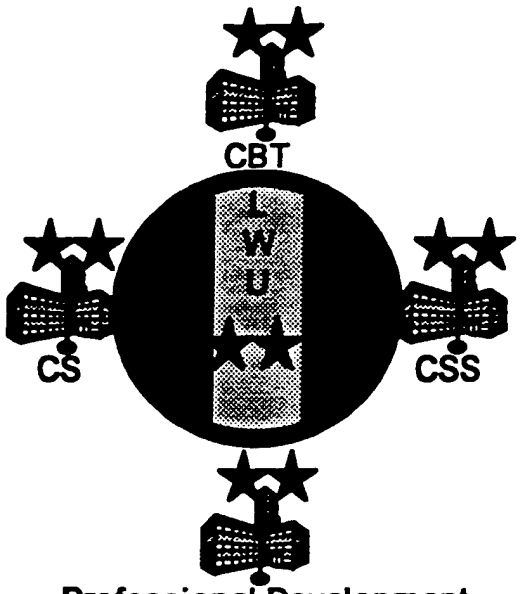
the unit training plan. This database is designed to evolve continually based on the lessons learned from CTC Observer Controllers (O/C), doctrinal proponent changes from analyzing automated unit training feedback systems and lessons learned from deployed forces.

The Interactive Training Event Menu (ITEM) implements emerging technology to merge maneuver/collective, gunnery and soldier CATS matrixes to replicate combat conditions. Based on the trainer's input to SATS, ITEM selects the best mix or combination of the available live, virtual, and constructive environment resources and recommends event templates and models for a sequence of training events. Next, the training event model generates unit and threat systems, scenarios, environments, and Semi Automated Forces (SAF) for unit training and provides the information back to SATS to request the required training resources to support the plan. Using SATS the trainer can adjust any of the variables to better meet his training requirement throughout the process.

The final piece of the training event model is the STAARS. Throughout each training event, the unit's performance is automatically assessed against the trainer's structured training objectives using Army standardized, automated MTP training evaluation outlines in the task database stored in the library. Unit gunnery performance captured during the exercise and O/C input provide additional feedback to the trainer. The automated assessment tools allow the trainer to replay key portions of the training event or change scenario characteristics using the event generator to increase or decrease the intensity of the training environment during the event or for future exercises.

Using the automated assessment tool, the trainer can automatically update his unit training status. Transparently, the system tracks unit success and weakness as part of the data studied for upgrades of the task database, doctrine, and Tactics, Techniques & Procedures (TTP) manuals. Training resource usage and costs are also compiled for the trainer to use in his future training planning and for capturing total training cost to help program training requirements.

Since the institutional and self-development pillars of training are tailored to provide soldiers who can meet unit collective training requirements, the Warrior XXI Plan is prepared to compliment the WF XXI Campaign Plan. The mission of Warrior XXI is to assess and implement investments in technology and installations to produce competent, confident soldiers and leaders in the 21st century. The intent is to retain the essence of TRADOC in a nucleus of fewer, high technology schools organized as the LWU. The LWU will leverage information age technology and use small group methodology to provide relevant training and leader development to challenge quality



Professional Development

men and women to meet ever changing demands of the Army.

To move us from today's proponent based instruction to the high LWU of the 21st century, the WARRIOR XXI plan is comprised of three main efforts.

- Design the LWU: The design will consist of multiple colleges (e.g. combat, combat support, combat service support, and professional development) to train respective branches consistent with Base Realignment and Closure (BRAC) strategy.

- Leader Development: Develop new collective training strategies in coordination with the Army Science Board, who is tasked to determine which technologies the Army should invest in to educate 21st century leaders.

- Classroom XXI: The classroom XXI concept will expand the use of current and future technology to support "classrooms without walls" and "distance learning" concepts for the Army's LWU of tomorrow. Other characteristics of the classroom are:

* Enable training experiences in live and synthetic environments
* Teach doctrinal concepts
* Involve student in experiments of future concepts
* Include collective training
* Integrates the three pillars of training
* Provide student accessible electronic information archives
* Develop a communications link with other leaders, universities, and units
* Provide leader access to the institution
* Provide electronic mentorship
* Distance Learning: Distance learning is an army initiative to leverage print

and multimedia training technologies to broaden students access to training, modernize functional and leader development training at proponent schools, and resolve training shortfalls identified by unit commanders. The Army Long Range Training Plan (ALRTP) directs TRADOC to:

** Implement a distance learning program by moving portions of resident training from the schoolhouse to soldiers at home station.

** Use advanced technologies to teach more students with fewer instructors.

** Lower costs through reduced movement of personnel and equipment to training areas.

** Where it makes sense, automate the first phase of courses as a correspondence phase.

** Functional courses: Eliminate redundant courses and over production in remaining courses.

The linking units to institutions using the information highway establishs a two way transfer of information between the unit and individual training pillars. Classroom XXI will "plug in" electronically to on-going training and operations, for classroom examples, demonstrations or active participation in classes by students. Students will be exposed to information age technology and new requirements for training will be identified. New technologies will require new skills to call for and adjust fire, when all friendlies are looking at the same near real time representation of the digitized battlefield. Resupply will be streamlined through this common picture of the battlefield, causing institutions to upgrade logistics instruction to reflect reality. The linkage of WF XXI to Classroom XXI will produce soldiers who are better qualified to meet the Army's needs. Additionally, institutions are the key link to the continued education of Force XXI soldiers by providing dynamic, relevant self development courses through a variety of electronic media for the soldiers of tomorrow. Some examples are:

* Institutions establish basic simulation/automation skills

* Units, CTCs, and institutions integrally linked

* Virtual and constructive simulation supplement the institution's capstone live training

* On line multimedia training courses

* Integration into real time simulation exercises over the information highway

e. Assign responsibility for future development of Army training.

Component 1, SATS, must be emphasized to help design a more holistic software system to meet the needs of: trainers in institutions and units, training resource managers, training developers and combat developers. The Army Training Support Command (ATSC) will lead this effort as the executive agent for the DA Deputy Chief of Staff for Operations (DCSOPS) who is the proponent for SATS.

Component 2, TSPs, to emplace TSP's ranging from squad/crew to corps level two layers of packages must be designed and integrated. First, brigade and below TSPs will be designed and built by the Force XXI Training Program (FXXITP). The second component, corps and division TSPs, will be lead by Combined Arms Center (CAC). Initially, FXXITP will lead the effort of component 2.

Component 3, TADSS, must be fully embedded in future systems and must be seamless to the execution of training programs. Component 3 will be lead by the National Simulation Center as the combat developer for DA DCSOPS who is the proponent for TADSS.

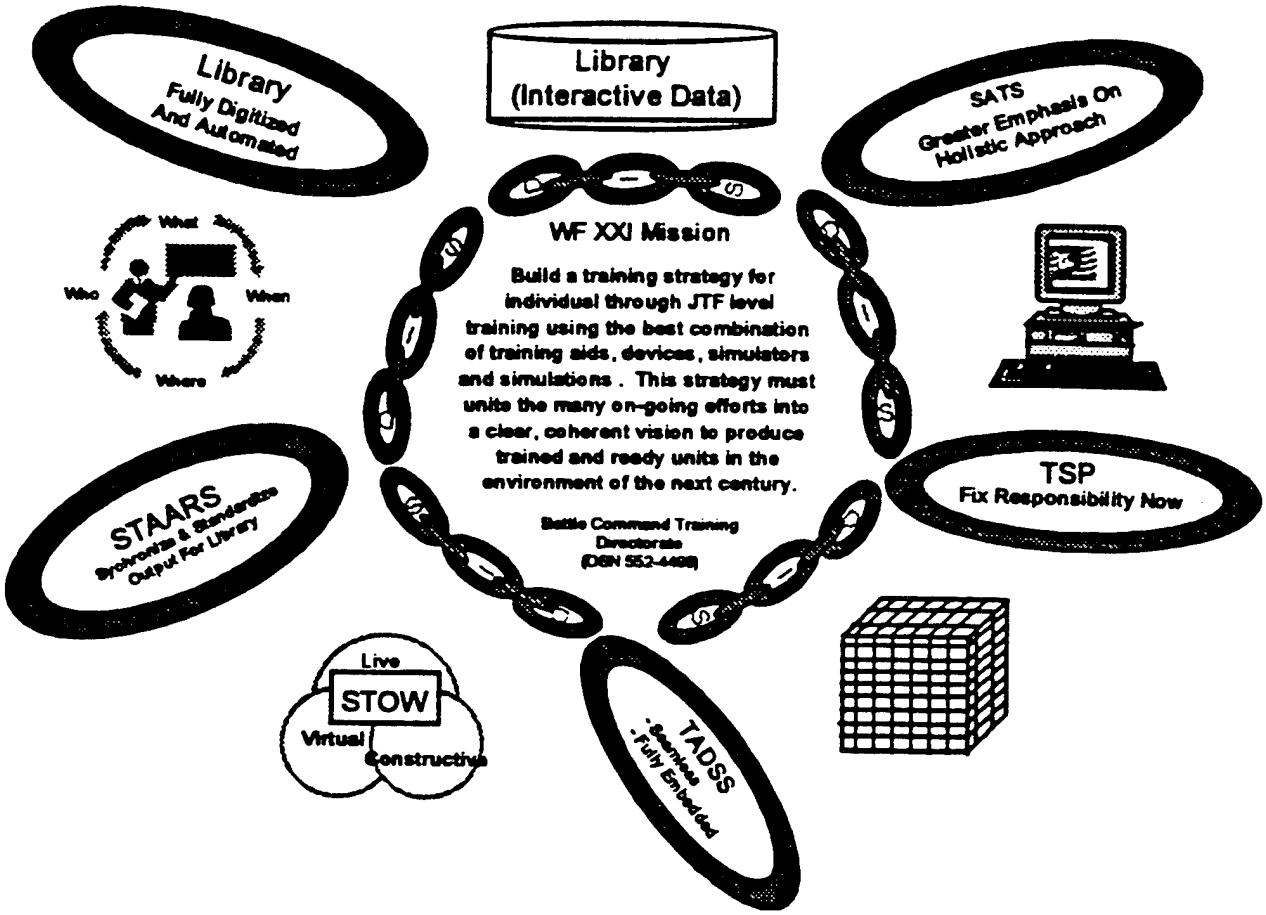
Component 4, STAARS, must standardize and synchronize the collection of data by all future systems in support of training management, training assessment, training development, resource management, training resource usage, budgeting and Army lessons learned. Component 4 will be led by Deputy Chief of Staff, Training, (DCST).

Component 5, the library, must fully digitize all the required training information and establish standards and protocols for storage and access of the data. Information from current systems must be integrated to support training activities and meet the data requirements of the SATS. Component 5 will be led by the ATSC as the executive agent for DA DCSOPS who is the proponent for ATIMP.

4. CONCLUSION

The AT XXI vision will be achieved by synchronizing the effort of all five components developments. To be successful, each component must be fully integrated with each other. Integration of all components cross Major Area Commands (MACOM) and Depart of the Army (DA) command authority. To get the best system, we must use the

synergistic effect achieved from gleaming the best of each component from where ever the expertise is found to maximize the efficiency of the system. The MACOMs and DA have much to gain from successful completion of the product.



CHAPTER 3

Standard Army Training System (SATS)

1. INTRODUCTION

The Standard Army Training System is a computer based software system implementing the training management doctrine in FM 25-100, *Training the Force*, FM 25-101, *Battle Focused Training*, and FM 100-5, *Operations*. SATS gives unit and institutional trainers an automated tool for management of their training program. SATS provides integration of Mission Essential Task List (METL) development, planning for training and resourcing of training. The current SATS (version 3.1) is an archaic system designed to operate on the Intel 8086 microcomputer platform. In its present form, SATS has many shortcomings such as slow performance, printer incompatibilities, limited report output, primitive data communications, redundant data input, and other restrictive capabilities.

2. MISSION

Provide an automated training management system designed to enhance the management, planning, and resourcing of unit and institutional training for the total Army.

3. Concept

SATS version 4.x will bring training management into the 21st century. This system will combine training doctrine with automation technologies to help trainers develop and manage their training programs. Future SATS will be multifunctional and will support the needs of units, institutions, and the Department of the Army (DA) for both active and reserve components with a wide array of training management features. It will be the objective automation solution for implementing battled focused training in units and institutions, and will meet the resource utilization and costs requirements of DA. Some of SATS main product requirements are:

- Developing and refining METL by institution, Table of Organization and Equipment (TO&E) and Table of Distribution and Allowances (TDA) commanders

- Developing and refining training priorities

- Building structured training plans and training schedules fully integrated with available resources

- Producing high quality training calendars and other products to support training

- Reporting unit readiness and training resource usage

SATS version 4.x will develop and schedule training resources and will capture resources usage for future requirement programming actions. Combined Arms Training Strategy (CATS) matrices are the foundation of the system and form the base for developing training plans and training programs.

CATS provide the strategy on how the Army trains the force to meet readiness requirements. They provides standardized requirements and resource options for collective training. CATS are the basis for developing, acquiring, and managing current and future training resources for both the active and reserve component units and schools. Under the purview of the CATS, proponent schools develop unit training strategies for tactical units at battalion level and below. These strategies propose the frequency of annual training events to achieve desired levels of proficiency and readiness to accomplish battle-focused METL requirements. The proposals are prepared as matrices of training event menus correlated with unit levels and critical training gates. The matrices also identify the training resources (e.g., Combat Training Centers (CTCs), Operating Tempo (OPTEMPO), ammunition, training ranges and land, and Training Aids, Devices. Simulators and Simulations (TADSS), including Tactical Engagement Simulations (TES) devices required to support each proposed training event. Current CATS are governed by AR 350-41, *Training in Units*, TRADOC REG 350-35, *The Combined Arms Training Strategy* and TRADOC PAM 350-10, *Combined Arms Training Strategy Development.*

Today's training strategies, and funding trail, are based on input from each proponent. CATS are supported by a training resource management system consisting of master and modernization plans for major training resources (e.g., Tactical Engagement Simulation-Master Plan (TES-MP) training system, range modernization, and CTC). Master plans such as the TES-MP, define the current baseline and forecast future resource requirements for current CATS, while modernization plans align projected and available resources with future CATS training requirements. Current CATS strategies reflect the baseline and apply to the execution, budget, and program years. Future CATS strategies are influenced by projected threats, operational missions, weapons and training technologies, and budgetary guidelines.

CATS consist of three mutually supporting components:

- Unit
- Institution
- Self development

Linking units to institutions establishes a two way, "real time" transfer of information between collective and institutional training. The 21st century classroom will "plug in" electronically to on-going training and operations for classroom examples, demonstrations or active participation in classes by students. For the first time, institutional students will be exposed to information age technology, resulting in instantaneous communication. New technologies require new skills to call for and adjust fire when all friendlies are looking at the same near real time representation of the digitized battlefield. Resupply will be streamlined through this common picture of the battlefield, causing institutions to upgrade logistics instruction to reflect reality. The linkage of institutional training to current unit events will produce better qualified soldiers who are better at meeting the Army's needs. The institutions are the key link to producing fully qualified soldiers to units and providing dynamic, relevant self development courses through a variety of electronic media:

- Institutions establish basic simulation/automation skills
- Units, CTCs, and institutions integrally linked
- Virtual and constructive simulation supplement the institution's capstone live training
- "Classroom without walls"

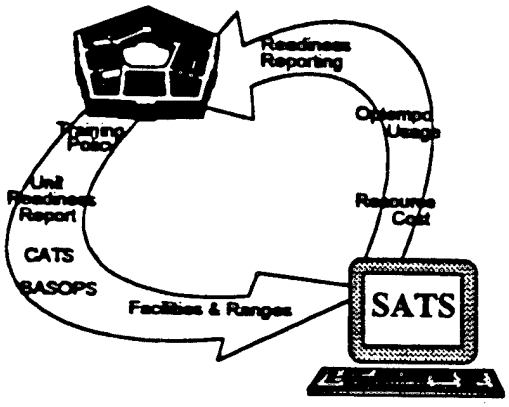
SATS 4.x is the center of gravity of Warfighter XXI (WF XXI). It will provide trainers automated support for producing quarterly, annual, and yearly guidance. It will incorporate command training guidance into long range, short range, annual, and pre and post mobilization training plans and associated calendars. SATS will provide the capability to access and graphically present the data in these documents for use in training briefings and provides trainers the ability to review and assess their subordinate's execution of training guidance.

SATS 4.x will incorporate training exercise standards contained in mission training plans (MTP). Many MTPs contain sample Field Training Exercise (FTX) and

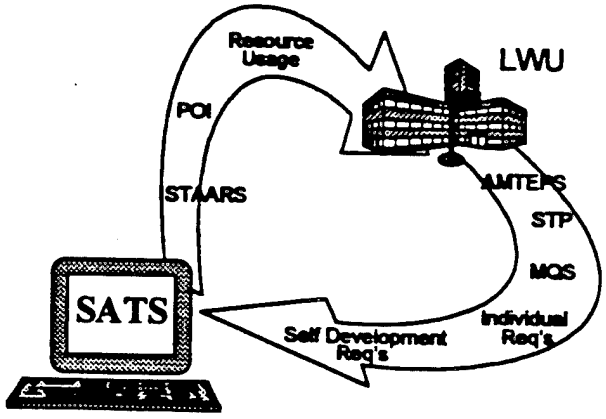
Situational Training Exercise (STX) scenarios listing the tasks trained within the exercise. SATS will use this information to develop a situational training template for creating long and short range training plans. This is an interactive process with SATS recommending event scheduling sequences and frequencies for the trainers approval.

SATS 4.x will provide the capability to electronically transfer information both laterally and vertically. Electronic connectivity enables trainers to share information with peer units and permits them to query their own and subordinate training plans to view the execution of command training guidance.

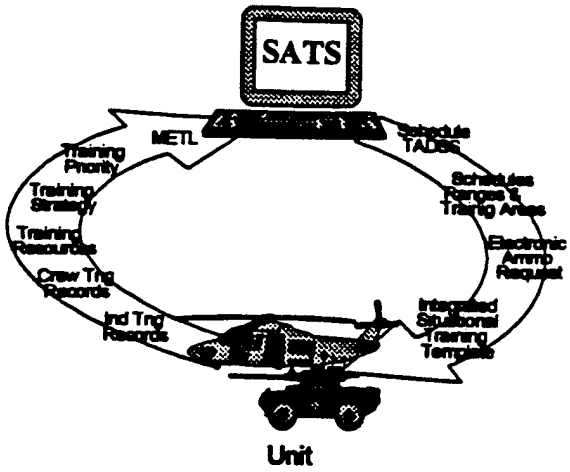
SATS 4.x provides requisite training management support for the Department of the Army. This automated support provides the capability to integrate the doctrine contained in FM 25-100/101 with the procedures trainers use to manage their training programs. DA will be able to "roll-up" training resource and readiness data from units and the Land Warfare University (LWU). SATS will be built to satisfy all of the software training management requirements for three primary groups of users - units, LWU and DA trainers and resource managers. SATS will support various echelons of users from HQDA, TRADOC institutions, and platoons through task force, as well as a large number of enlisted and officer occupational specialities.



SATS 4.x will be capable of providing information to TRADOC's LWU from numerous sources based on lessons learned, resource usage, and other variable factors to allow for revisions in Program of Instructions (POIs), Army Training and Evaluation Program Mission Training Plans (AMTEPs), Military Qualification Standards (MQS), etc. This will be key to maintaining a system more responsive to user requirements.



SATS 4.x will be the primary automated tool in units for commanders to manage training. This automated support integrates the doctrine contained in FM 25-100/101 with the procedures commanders use to manage their training programs. SATS functionally will focus on providing fully integrated support for the core training mission. It will identify and develop mission essential collective and individual tasks, identify training events and exercises with their required frequencies and critical gates, and the resources needed to execute the training program.



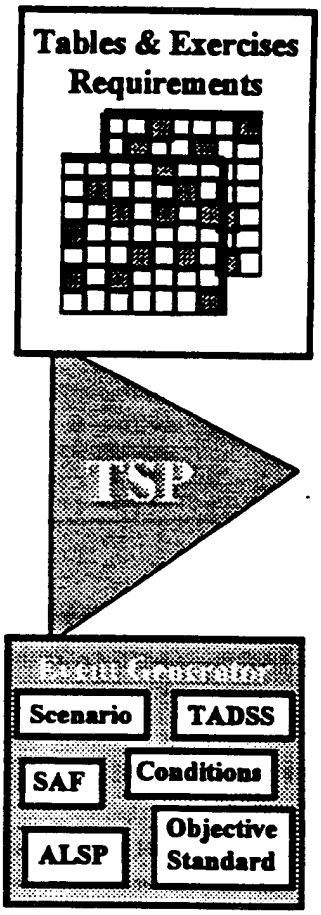
4. CONCLUSION

SATS, is the center of gravity of WF XXI. It will be the automated tool for implementing battle focused training, and will be the conduit through which information is passed among the other four components comprising WF XXI. As Force XXI moves toward more complex training management requirements, emphasizing greater reliance on structured training with limited resources, it requires a more sophisticated, automated software system to assist commanders in the planning, preparation and execution of training. Through the continued update of CATS and the spiral development process, SATS version 4.x will meet this requirement.

CHAPTER 4

Training Support Packages (TSP)

1. INTRODUCTION



Training Support Packages (TSP) are the end state of training development. TSPs consist of all the documentation, organized support requirements, and training requirements a unit needs prior to train. This information and the support products are developed and maintained by trainers, training support centers, and contractors. The foundation of TSP development is the Combined Arms Training Strategy (CATS). CATS defines the training strategies a trainer used by specific TO&E units to meet required readiness.

2. MISSION

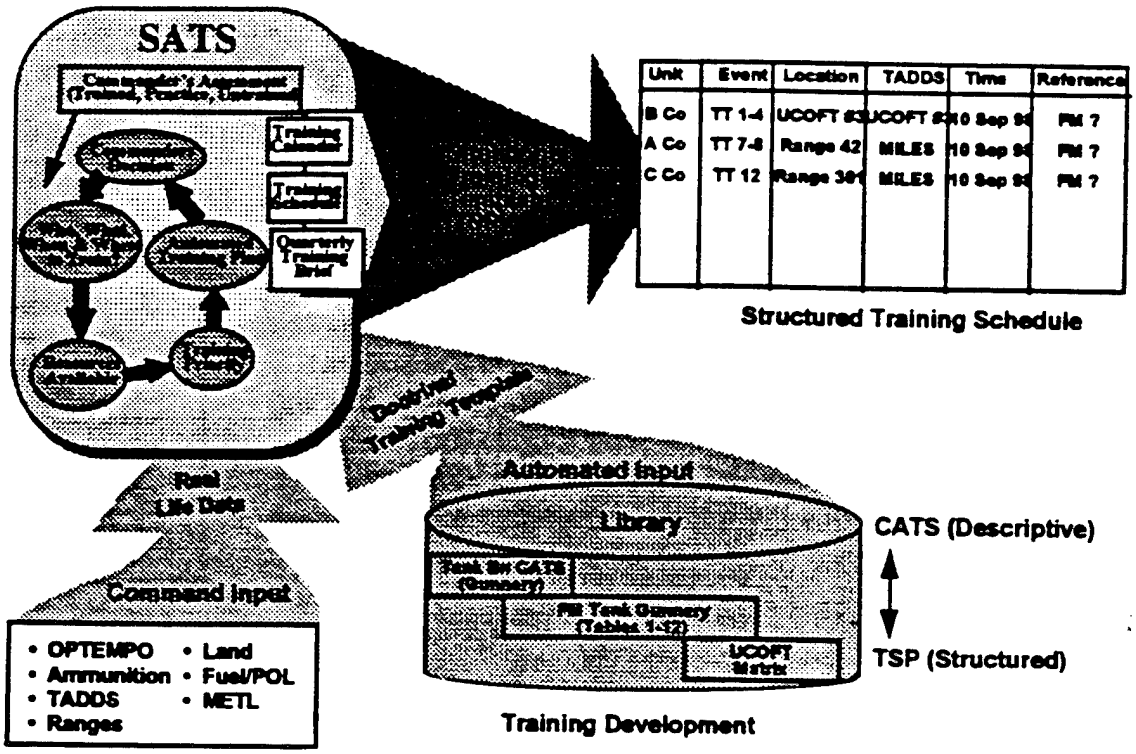
Provide an automated, structured situational training template resourced to generate collective training events.

3. CONCEPT

A TSP is a set of instructions describing how to plan, prepare, and conduct training. The tables and exercises from which a trainer will choose will be similar to Conduct Of Fire-Trainer (COFT) matrix. A proficiency level is determined based on previous training experience and demonstrated pre-test ability. This level is then set for the individual or unit to enter into the training event. Simulations/simulator based training will easily adapt to various user proficiency levels to provide the opportunity to train, test and re-train. A true "Crawl, Walk, Run" methodology of training will be realized. Trainer's inputs to the TSP will encompass individual and crew training records, resource availability (i.e. OPTEMPO, ammunition, land, fuel/POL, etc.), training strategy, training priorities and mission essential task lists (METL).

In addition, the TSP provides pre-exercise event generation. This will stream-line the training process by eliminating the need for extensive preparation of support products such as, higher headquarters Operations Order (OPORD), scenarios and initialization of the training tools. The TSP will also include a standard terrain database, and semi-automated forces with variable levels of conflict intensity. The

training event is executed by the trainer using objective army-wide standards of performance and evaluation developed as an integral part of the TSP.



Critical Combat Functions (CCF) are the current basis for the majority of the task based training development. These high value training tasks have been identified and a task, condition and standard exists for many of the battalion and brigade level training missions. In the future, performance comparison to established objective standards will be the norm, instead of the exception.

The role of the TSP in WFXXI is to provide a structured and disciplined CATS development system. Specifically, to ensure true combined arms strategies are developed instead of proponent based stove-pipe strategies. Situational training event templates will be developed as an end product of the doctrinal training requirements (CATS) combined with the commander's input processes through SATS. The templates will be a structured approach to training management, pulling from the CATS and implementing the best training event for the unit based on current proficiency level, resources and the higher trainer's guidance. Battle staff training will be both vertically (battalion - brigade - division - corps) and horizontally (within the task force/brigade/division/corps tactical operation center, or tactical command post) structured to maximize the realism and integration of the combined arms team. Division and corps TSPs will be developed to support the Battle Command Training Program (BCTP), Warfighter Exercises (WFX) and staff training events. Joint, coalition

and allied training strategies will drive TSP development and event structuring in the future.

The current best case training development effort is being made by the Force XXI Training Program (FXXITP). The FXXITP is the mechanism for training Force XXI developing a coherent method to define Force XXI brigade and below training requirements. The FXXITP is developing TSPs for simulation based/simulator enhanced training exercises. The FXXITP is the critical linkage of the Close Combat Tactical Trainer (CCTT) and Combat Support/Combat Service Support (CS/CSS) functionality for the Combined Arms Tactical Trainer (CATT). Training developers within TRADOC and the Army are working with research being done by the Army Research Institute/Advanced Research Projects Agency (ARI/ARPA) and other military contractor support. The projected first cut of their strategy and TSPs completion is September 1995.

4. CONCLUSION

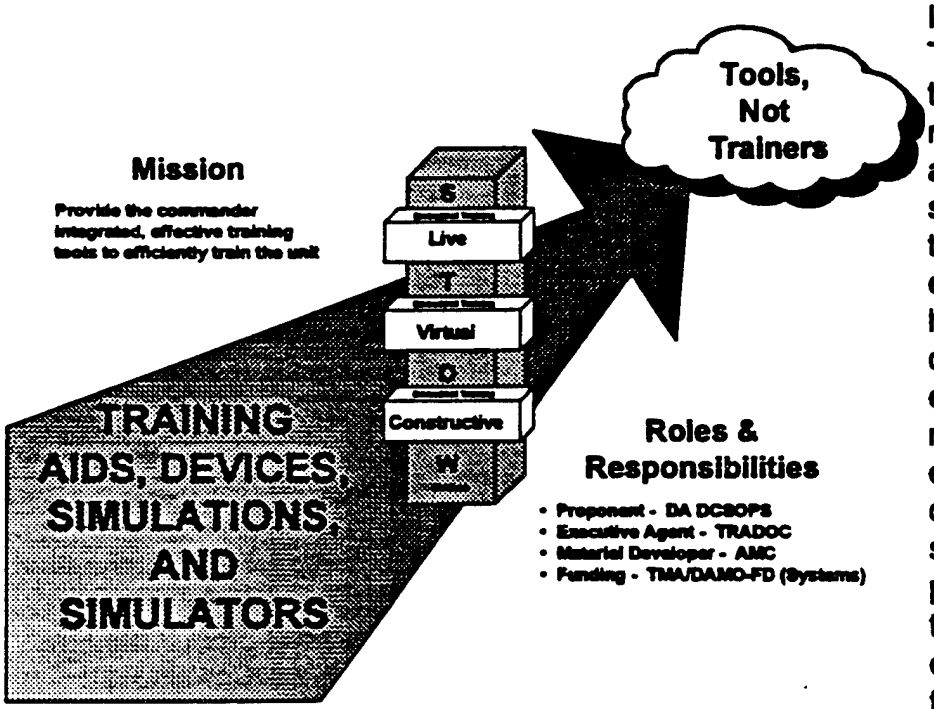
As the Army moves into the twenty first century, the methods used to plan and execute training will change. The diversity of missions, scarcity of resources, increased weapon range/leathality and the decrease in available training time will force the army towards providing structured training products. TSPs as envisaged in WF XXI, will fulfill this need. Through the use of automated tools the tailoring of training events to given situations will allow for more realistic and effective training. Research shows soldiers want tough, realistic and meaningful training. Coupled with SATS, TSPs will allow future trainers to provide high quality combined arms training for Forces XXI soldiers, while minimizing the trainers administrative and planning workload.

CHAPTER 5

Training Aids, Devices, Simulators and Simulations (TADSS)

1. INTRODUCTION

The Army's training goal is to execute tough, realistic field training exercises as our primary means of training. However, decreasing resources, increasing weapons system ranges and lethality, and environmental constraints are limiting our ability to train. These factors, coupled with the broad power projection mission rehearsal capabilities, and the digitization of future forces point to a need to leverage the rapid growth in technology to create synthetic battlefields in future Training Aids, Devices, Simulators and Simulations (TADSS). While it is well understood that today's TADSS are used to supplement live training, tomorrow's TADSS must provide the trainer mission rehearsal capabilities and options to train segments of the force to standard before entering into a crucial high resource or safety-constrained environment. They must also exploit emerging technology to change from the non-system TADSS of the past to the TADSS of tomorrow that are embedded and linkable through the Distributed Interactive Simulations (DIS) architecture.

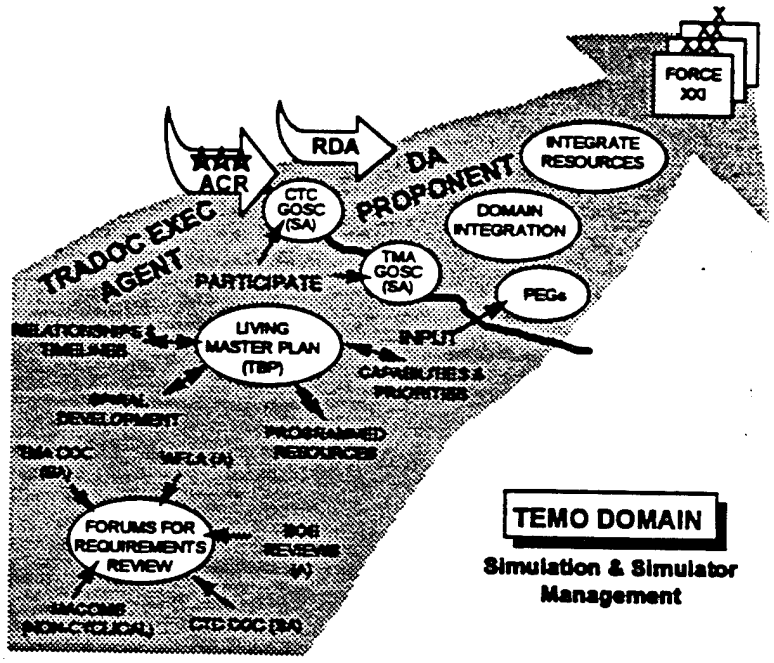


2. MISSION

Provide integrated, effective training tools to the commander to efficiently train the unit.

3. CONCEPT

The interoperability and fidelity of future TADSS is key to the Warfighter XXI concept. They must be interoperable through the Synthetic Theater of War (STOW) architecture to link the live, virtual and constructive pieces of the training arena. The current state of TADSS includes system and non-system devices, many of which overlap and underlap in the tasks they train. Simulations that are linked together use the Aggregate Level Simulation Protocol (ALSP) to communicate. This is an improvement on previous conditions. It is only a short-term fix until a family of systems can be fielded. Finally, current TADSS are an example of the short-term investment that was common when funding was readily available. With the continued reduction of resources, we must plan to fund and field a mutually supporting system of TADSS that provides an increased training transfer for the investment. This will include STOW, standardized databases, fully embedded training capabilities in operational systems, reconfigurable simulators, and a fully integrated Army-wide system of interoperable TADSS.



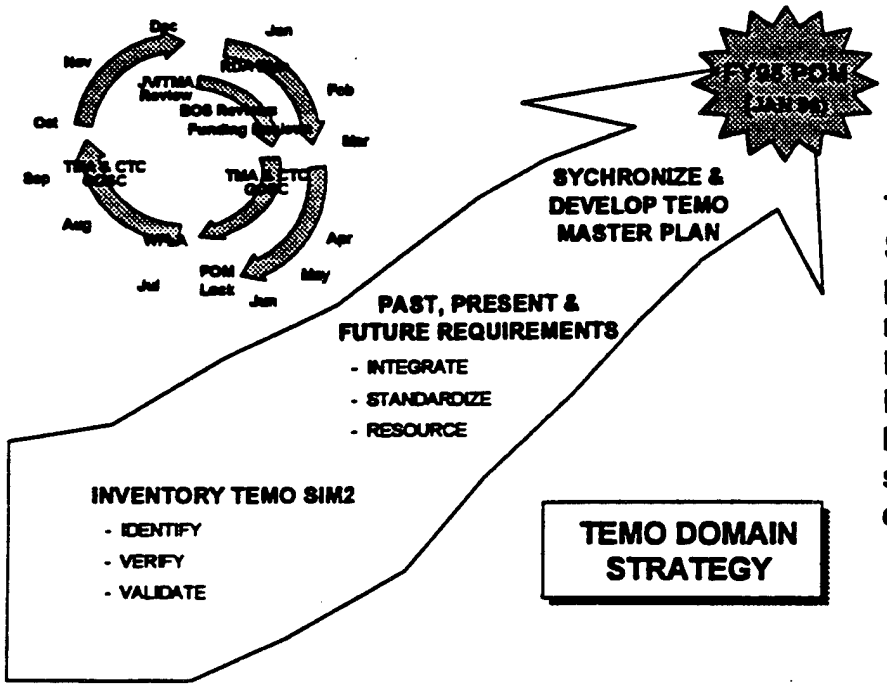
a. Management Process. Recent studies identify overlap and redundancy in Models and Simulations (M&S) requirements. To synchronize the Army's M&S requirements and procurements, the Chief of Staff of the Army (CSA) designated the Deputy Chief of Staff, Operations (DCSOPS) as the M&S czar. To enhance future management, the DCSOPS categorized M&S into three domains: Training, Exercises and Military Operations (TEMO), Advanced Concepts and Requirements (ACR) and Research, Development and Acquisition (RDA). The DCSOPS designated DCSOPS-Training (DAMO-TR) to manage the TEMO domain. All TADSS fall under the TEMO domain. The Training and Doctrine Command (TRADOC), Deputy Chief of Staff for Training (DCST) is the TEMO domain Major Army Command (MACOM) sponsor. The following processes identify, verify, validate, integrate, standardize and coordinate resourcing TEMO domain requirements:

(1) Battlefield Operating Systems (BOS) reviews.

(2) Warfighting Lens Analysis (WFLA).

(3) Training Mission Area (TMA) Council of Colonels (CoC) and General Officer Steering Committe (GOSC)

(4) Combat Training Centers (CTC) CoC and GOSC.



TRADOC's TEMO Domain Strategy is a three-step process to achieve domain management goals prior to Fiscal Year (FY) 98 Program Objective Memorandum (POM) submissions. That deadline is January, 1996.

b. Current TADSS. With very few exceptions, the large majority of current TADSS are non-system devices.

(1) Live

(a) Multiple Integrated Laser Engagement System (MILES) is a family of training systems which simulate the effects of direct-fire weapons at their operational ranges and operate in a fully integrated tactical training environment. MILES provides the capability for two-sided, real-time tactical engagement at unit sizes up to battalion and for realistic casualty assessments.

(b) Combat Training Centers (CTC) Provides realistic joint service and combined arms training. It is designed to provide units the most realistic battlefield available-primarily in the "live simulation" environment. There are four components of the CTC domain:

[1] National Training Center (NTC), Fort Irwin, CA.

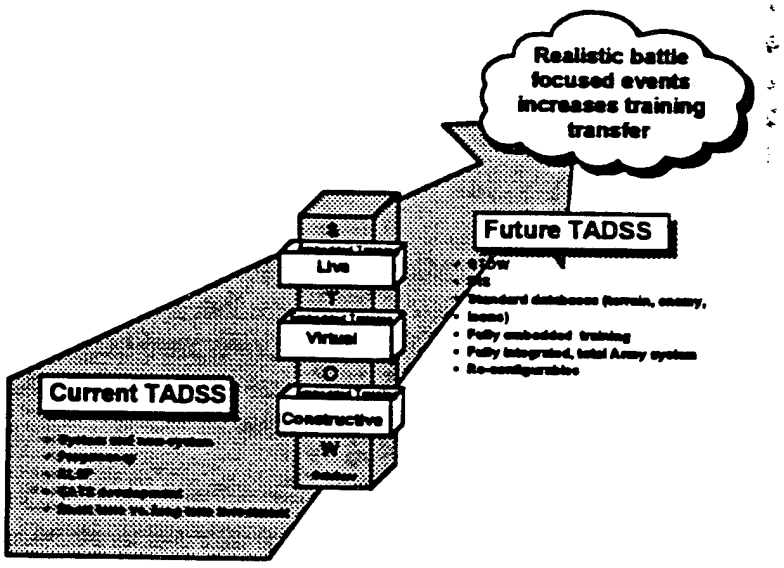
[2] Combat Maneuver Training Center (CMTC), Hohenfels, Germany. (CMTC also uses constructive simulation-Battalion/Brigade Battle Simulation [BBS]).

[3] Joint Readiness Training Center (JRTC), Fort Polk, LA. (JRTC also uses constructive simulation-JANUS).

[4] Battle Command Training Program (BCTP), Fort Leavenworth, KS. (BCTP uses only constructive simulations-Corps Battle Simulation [CBS], Tactical Simulation [TACSIM], and Air Warfare Simulation [AWSIM]).

(c) Precision Range Integrated Maneuver Exercise (PRIME) instruments Infantry and Armor Company Team vehicles, Opposing Forces (OPFOR), pop-up targets, and Dismounted Infantry for realistic, controllable, MILES based, force-on-force exercises. It provides controllable shoot-back targets for a free play environment and data collection to record crew through company level performance. Sufficient hardware to instrument an OPFOR is available for Force-on-Force exercises. Targets and player systems are linked through telemetry and a GPS network to the Command and Control and After-Action Review (AAR) facilities which will be in transportable shelters. PRIME incorporates MILES II, Telemetry Network, Global Positioning System (GPS), and thru Sight Video (TSV) technologies. For AARs, it provides audio and video recordings, computer generated statistics, and map graphics printouts. PRIME is a tactical trainer which trains fire and maneuver, command and control, target detection, identification, and engagement.

(2) Virtual: Simulation Network (SIMNET) is a virtual simulation that enables mechanized units to train crew through battalion (depending on the size of the SIMNET center) tasks as well as conduct gunnery exercises.



(3) Constructive

(a) Janus is a battle focused simulation for company and platoon leaders to train the synchronization of the maneuver, fire support, mobility/countermobility/ survivability and air defense artillery (ADA) Battlefield Operating Systems (BOS).

(b) Brigade/ Battalion Battlefield Simulation (BBS) supports the training of commanders and staffs of battalions and brigades in the synchronization of all BOS and the execution of mid- to high-intensity tactical operations.

(c) Corps Battle Simulation (CBS) supports the training of joint corps and division commanders and staffs in the synchronization of heavy, light, aviation and Special Operations Forces (SOF) during the execution of mid- to high-intensity conflict.

(d) Combat Service Support Tactical Simulation System (CSSTSS) supports the training of Combat Service Support (CSS) commanders and staffs from battalion to theater army in the detailed tactical, operational and strategic level logistic functions. The linkage of CBS and CSSTSS enhances the training of division, corps, and Echelons Above Corps (EAC) level commanders and their staffs in logistic operations and provides realistic, doctrinally correct training of combat, combat support, and combat service support personnel.

c. Future TADSS

(1) Live

(a) Tactical Engagement System (TES), is an advanced live simulation collective training methodology characterized by, the use of tactical systems supported by a family of TADSS in free play, force-on-force, field training exercises. TES has three subsystem components. The Simulator Subsystem includes training aids, devices, simulators, and simulations as well as support procedures to simulate weapons casualty-producing effects in real time. The Control Subsystem consists of observer controllers who referee, ensure realism, provide training feedback, and may include computer and instrumentation. The Management Subsystem supports the process to plan, schedule, conduct, and evaluate training.

(b) Combat Training Center Operational Information System (CTC-OIS) system provides the CTC with a full data collection and feedback capability which includes all hardware and software necessary to provide data collection, processing for presentation, and feedback to units.

(2) Virtual: Combined Arms Tactical Trainer (CATT): CATT is a family of high fidelity networked virtual training systems that uses the DIS architecture. CATT enables active and reserve components to train by accomplishing a wide array of tasks from crew to battalion level using a combination of simulators, staff workstations, and Tactical Operations Center (TOC) mock-ups. Each CATT system is DIS-compatible, interoperable and uses common databases and hardware components where possible. CATT systems include:

(a) Close Combat Tactical Trainer (CCTT) trains crew through battalion collective tasks and sustains gunnery proficiency for armor and mechanized infantry units. CCTT also supports leader training at the armor and infantry schools.

(b) Aviation Combined Arms Tactical Trainer (AVCATT) enables attack, assault and cavalry units to train individual through battalion tasks as well as conduct gunnery training. AVCATT components are fully transportable to enable units to sustain task proficiency and rehearse missions in deployed locations. AVCATT also supports leader training at the aviation school.

(c) Engineer Combined Arms Tactical Trainer (ENCATT) supports sustainment training of divisional engineer battalions, companies, and platoons. ENCATT also supports leader training at the engineer school.

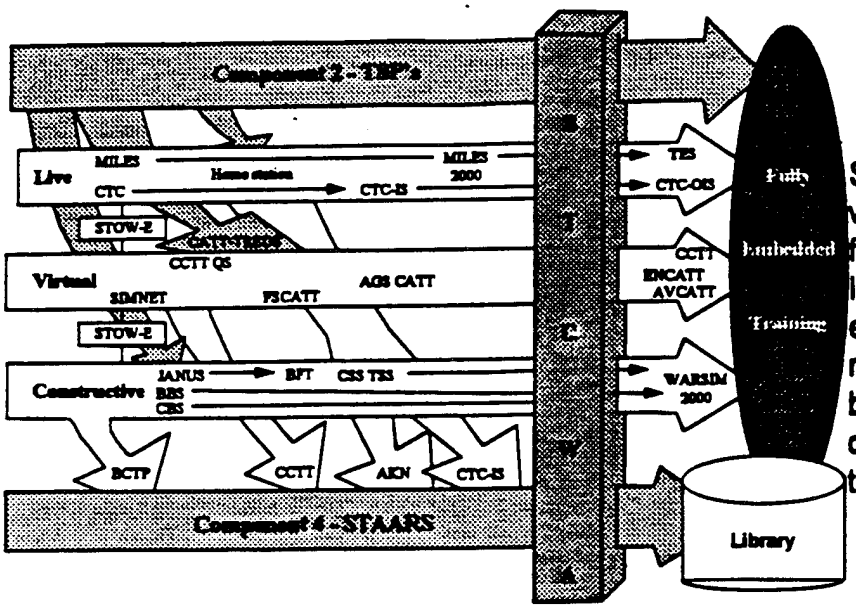
(d) Fire Support Combined Arms Tactical Trainer (FSCATT/Phase II) enables fire support synchronization and coordination training with ground maneuver forces for field artillery sections, batteries, and battalions. FSCATT also supports leader training at the field artillery school.

(e) Air Defense Combined Arms Tactical Trainer (ADCATT) is a system of manned air defense artillery simulators, support simulators, and Semi-Automated Forces (SAF) designed to support air defense artillery training. Systems include an emulation of the Forward Area Air Defense Command, Control and Intelligence (FAADC2I) architecture to support air defense artillery synchronization and coordination training with ground and army aviation maneuver forces. ADCATT also supports leader training at the Air Defense Artillery School.

(3) Constructive: The Family of Simulations (FAMSIM) supports the improvement of Command and Control (C2) throughout the Army by enhancing leader development and Command Post (CP) training. The current FAMSIM is a group of CP and leader development training simulations. They include:

(a) Tactical Simulation (TACSIM) is a classified model that replicates divisional through national intelligence collection assets.

(b) Battle Command Training Program (BCTP) Intelligence Collection Model (BICM) is an unclassified model that replicates division through national intelligence collection assets.



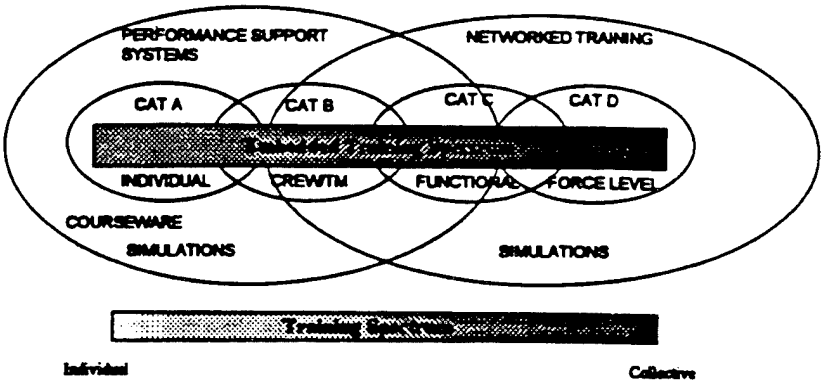
(c) Warfighter Simulation (WARSIM) 2000 will provide commanders from battalion to theater level with a training environment consisting of a realistic simulated battlefield, realistic CP conditions and usable training feedback.

(d) Joint Simulation System (JSIMS) will provide readily available, operationally valid synthetic environments for the Commanders in Chief (CINCs), their components, other joint organizations, and the Services to train, develop doctrine, assess plans and define operational requirements.

d. Distributed Interactive Simulation (DIS): DIS is a technical grouping of architecture standards and communications protocols that provide industry standards to the developers of various simulations and simulators. The application of DIS standards in new simulations and simulators will permit the interaction of various distributed compliant/compatible simulations and simulators to support army training requirements. Future seamless, distributed simulations and simulators will allow us to leverage technology to improve tomorrow's training strategies. DIS will give us the ability to fuse warfighter and developer to keep soldiers in the loop throughout concept development so that we can train as we intend to fight and can develop mission rehearsal capabilities to fight the plan within crisis/contingency timelines. Further, DIS will allow maneuver, gunnery, combat support and combat service support operations to merge into a seamless system for trainers and developers alike to assess performance and plan future training and army requirements. The ability to have all systems interacting and be able to measure performance against a future standard – in much the same way we do now for gunnery – is the real value of DIS to future training and requirements.

e. Embedded Training: Embedded training is provided by capabilities built into or added onto operational systems to enhance or maintain skill proficiency.

How Technology Satisfies Embedded Training



(1) System TADSS. Currently, the large majority of all TADSS are non-system devices. The ultimate goal of Warfighter XXI is to drive the development of the technology that will support fully embedded TADSS in the prime systems. This shift in balance between system and non-system TADSS will require a closer link between prime system matériel development and TADSS development.

(2) Embedded Training (ET) Action Plan. This is the TRADOC-approved plan that defines ET and lays out a short-term road map to integrate ET into the system development process.

(3) DA Pam 351-X. This draft DA Pamphlet will supersede the TRADOC-approved ET Action Plan and lays out the "how to" of developing embedded training in Army systems.

4. CONCLUSION:

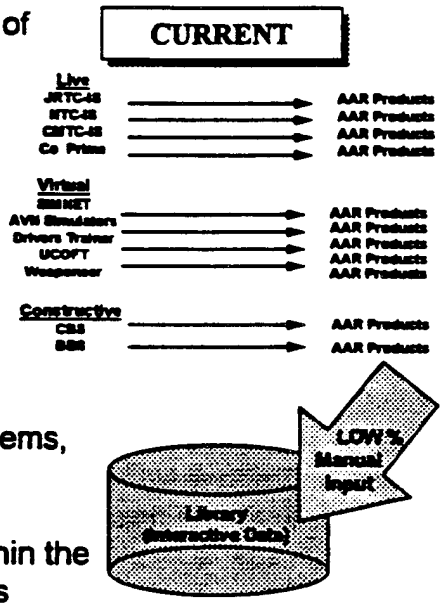
The vision for future TADSS is to provide integrated effective training tools to the commander. Efficient unit training requires leveraging common advances in modeling and simulation domains for TADSS development (i.e. terrain databases, semi-automated forces, AAR formats, and graphics symbology). TADSS must provide a mission rehearsal capability, adhere to embedded training policy and be DIS compliant. TADSS provide the commander with the instruments to orchestrate the training strategy and assessment cycle to enhance unit survivability and performance.

CHAPTER 6

Standard Army After Action Review System (STAARS)

1. INTRODUCTION

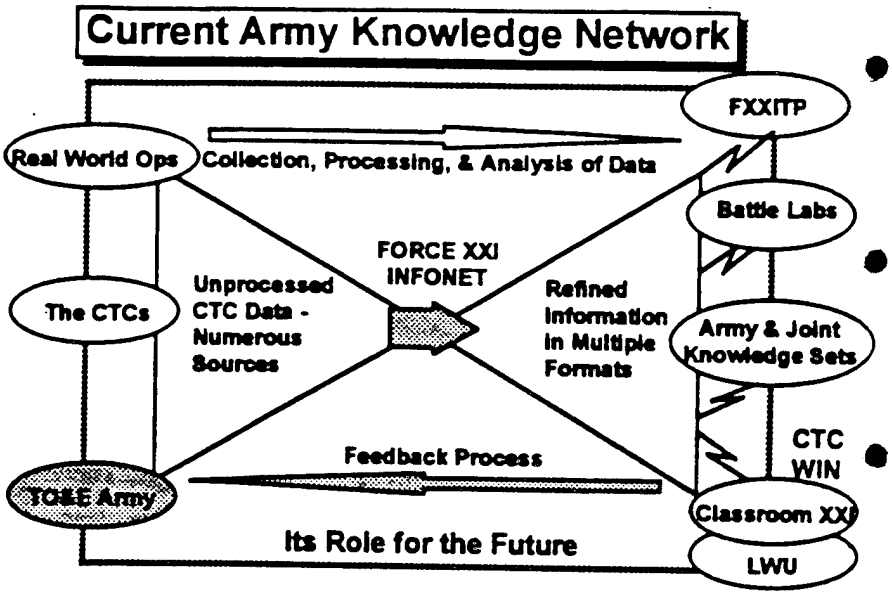
The Army has three training domains: live, virtual, and constructive. Each domain is a unique training environment using like systems to train soldiers. The live domain consists of the maneuver Combat Training Centers (CTCs): Joint Readiness Training Center (JRTC), National Training Center (NTC), and Combat Maneuver Training Center (CMTC), and local training areas (everything from dirt at Ft. Lewis to the CTC instrumentation systems). The virtual domain consists of training simulation systems giving the soldier a visual picture of the battlefield such as Simulation Networking (SIMNET), Unit Conduct of Fire Trainer (UCOFT), and Close Combat Tactical Trainer. The constructive domain consists of training systems used to train staffs such as Corp Battle Simulation (CBS), and Battalion/Brigade (BBS). The Synthetic Theater of War (STOW), while not a domain, integrates components of all three domains into a unique, multisystem, training environment.



Currently, each domain has existing AAR systems, but none provide standard AAR products. The information gathered from a training event is only useable by a particular system. Even systems within the domains do not provide standardized AAR products useful to each other. Some examples are: JRTC AAR products are not standard with NTC, and CBS AAR products are not standard with BBS. Furthermore, information gathered by the AAR systems is not shared nor is there any capability to share information. As an example, the data from the CTC instrumentation systems is not organized in standard form for easy use by trainers, combat developers, training developers, lessons learned collectors, resource managers, doctrine writers, testers, or individuals.

The Army Knowledge Network (AKN) is a new information system complimenting STAARS. The mission of AKN is to collect, catalog, store, and disseminate information

to Army users. The Combined Arms Center historian is responsible for AKN and a Data/Document Collection, Archival and Training Feedback/Archival Dissemination Master Plan (DATA-MP). The DATA-MP will provide an analysis of data collection requirements for the CTCs and their feedback relationship to Doctrine, Training, Leader Development, Organizational Design, Material, and Soldier Systems (DTLOMS). Future expansion of the DATA-MP will identify users and incorporate information available across the total Army.



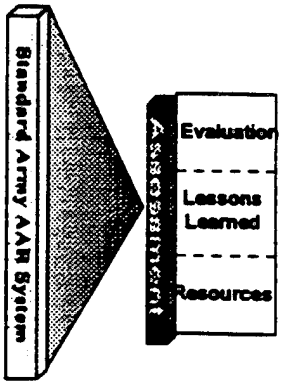
Today, AKN is collecting unprocessed data from the CTCs and Real World Operations. The AKN processes, analyzes, and refines this information for use by multiple users. Currently, there is no process to place feedback back into the system by the user, nor is the TO&E Army linked into the network.

2. MISSION

STAARS provides a standardized, automated storage, distribution, and retrieval system to the trainer for training evaluation, lessons learned library, and resource utilization. It provides to the doctrinal proponent a doctrinal based, feedback system on utilization of doctrine across the total Army. It also provides to the training and combat developer a doctrinal based, Army wide, information collection system, and to the resource manager a tool to collect usage of all training resources.

3. CONCEPT

STAARS will provide the trainer a standard tool to evaluate the effectiveness of his training. This enhancement will translate into improved feedback on training doctrine, resource utilization, changes to DTLOMS, and individual/crew training records by the user.



STAARS:

- encompasses the collection, processing, and distribution capabilities necessary to improve the AAR process.

- interfaces with current and future simulation systems, including models using the Aggregate Level Simulation Protocol (ALSP), local area networks, and wide area networks.

- supports the training feedback needed for trainers to capitalize on the training events.

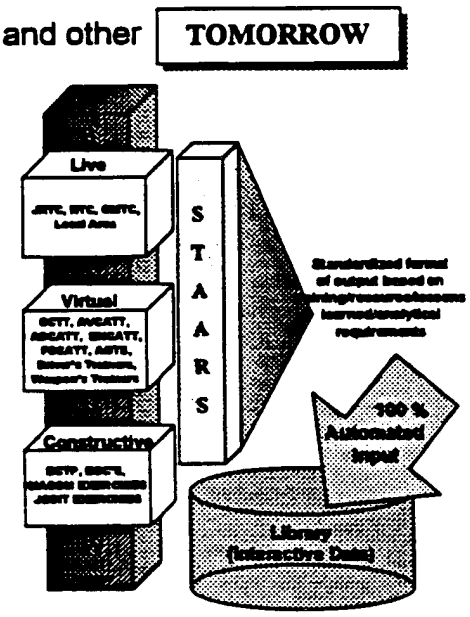
- is capable of operation in remote and non-remote communications configurations.

- is DIS compatible.

- is compatible with Training Aids, Devices, Simulations, and Simulators (TADSS), and embedded training systems.

- provides for development of leader development training concepts, methods, and strategies in support of battle command concepts and doctrine.

- provides a capability to translate lessons learned from the Center for Lessons Learned, Battle Command Battle Lab experiments, Command and General Staff Officer Course, CTC rotations, and other sources into leader development and collective training concepts, methods, and strategies.



- captures initiatives and lessons learned from throughout the training community (including industry and academia); evaluates and incorporates into Army leader development and collective training concepts, methods, and strategies.

All existing AAR systems, to include Army related USAF and Navy, provide information for integration into STAARS. In the long term, all future systems will be designed to provide input to STAARS. Future Command and Control (C2) systems will have embedded STAARS so the system can provide feedback either at homestation or while deployed.

Development of STAARS provides, for the first time, standardized data collection sought by the trainers, combat developers, doctrine writers, resource managers, lesson learned collectors, training developers, testers, and individuals. Additionally, STAARS incorporates and integrates both tester and trainer data to reduce duplication of effort in collection of information for the design and implementation of new systems.

STAARS is not a stand alone system. There are many sources of existing information to compile into an initial database. By design, STAARS will accept standardized information from live, virtual, and constructive training exercises; contingency operations, Department of the Army, and the Land Warfare University. STAARS assesses evaluations, captures lessons learned, documents and resource usage, and feeds standardized information into the library for storage and feedback into the Standard Army Training System. The information collected in the Library is easily accessed through automation with standardized feedback.

4. CONCLUSION

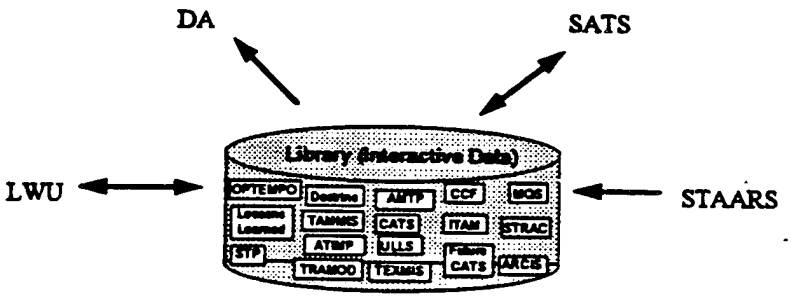
As we have seen from the experiences at the Army's CTCs, AARs are critical to the training of present and future soldiers. The trainer of the future will have STAARS as a tool incorporated into a fully integrated training management system to assist in assessing training. Harnessing the wealth of information available from training exercises and real world experience will help tomorrow's doctrine writers, training/combat/material developers, and resource managers improve products and systems for soldiers in the 21st Century while reducing redundancy in testing, evaluations, and resourcing. If we are to be successful in the resourced constrained, smaller, digitized force of the 21st Century, we must invest today in systems to define requirements for training tomorrow's soldiers. A fully capable STAARS is a critical link to the future.

CHAPTER 7

Library

1. INTRODUCTION

The ever growing need for digitized data is evidenced by the proliferation of information systems throughout the Army. To date most of these systems are primarily stove pipe systems designed to meet the specific needs of the user. Attempts to provide broader based "corporate" type databases have met with varied success. Developments in relational databases and information sharing technologies now give us the opportunity to develop seamless databases and libraries without walls. These technologies can provide leaders and soldiers at all levels with an almost limitless fount of information and the ability to pare it down to only the information desired. This seamless interface and data repository will provide the necessary inputs and collect the required outputs from the other four components of Warfighter XXI (WFXXI). This interactive library is also critical to the development of the Land Warfare University (LWU) concept. The ready exchange of information between the components of LWU can only be accomplished in this fashion.



2. MISSION

To provide access to information to assist army trainers.

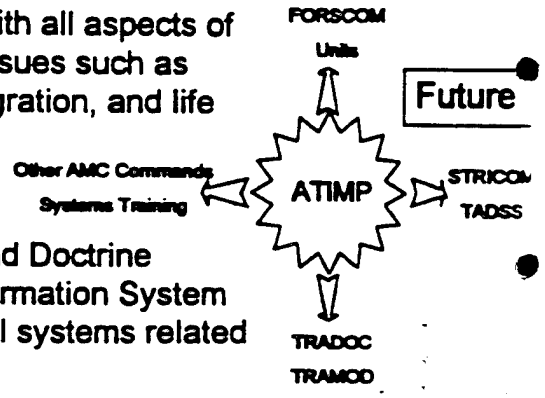
3. CONCEPT

The library will help provide the data necessary to answer the questions of what, when, where, how, and resources required that are central to developing an effective training program. Currently over 75 separate information systems with training implications have been identified. These systems may be grouped as primarily management information, resource information, or production systems. Effective training programs will require interface with most of these systems. Although some information from most of these systems will be required for units, they will not require all of the information from all of the systems. Thus it is necessary to be able to pick

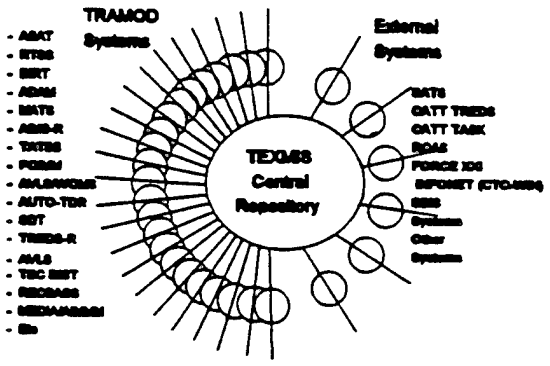
and choose needed information. This requires the ability to find and filter the information rapidly. Newly developed Graphical User Interfaces (GUI) and Artificial Intelligence (AI) abilities will ensure the system is user friendly and as intuitive as possible.

Emerging systems and technologies give promise of being able to provide the necessary data to units in a fashion reducing their administrative burden and increasing their efficiency. These emerging systems include:

1. Army Training Information Management Program (ATIMP) - ATIMP is the overarching training information management architecture that will cross Major Command (MACOM) lines and deal with all aspects of training. ATIMP will deal with broad automation issues such as communications, documentation, interservice integration, and life cycle management. Department of the Army Deputy Chief of Staff for Operations is the proponent and the Army Training Support Center is the executive agent for ATIMP. The Training and Doctrine Command (TRADOC) Executive Management Information System (TEXMIS) will serve as the central repository for all systems related to the ATIMP program.



2. Training Module (TRAMOD) - TRAMOD is a group of training information systems that fall under the control of the TRADOC Deputy Chief of Staff for Training (DCST). TRAMOD is designed to ensure the standardization, functional and technical integration, interoperability, sharing, and accuracy of training information. TRAMOD will be subsumed by ATIMP. The following are integral parts of TRAMOD:



   a. Standard Army Training System (SATS) - Version 4.0 will provide units from squad through Dept. of the Army with the ability to implement the training management doctrine contained in FM 25-100 and FM 25-100. In addition SATS, through its interface with the Library, will allow the accurate roll up of resources planned and expended in support of training. The use of relational database technology will allow the trainer to tailor the training program to meet the specific Mission Essential Task List (METL) of the unit. The ability to accept evaluation and lessons learned data back into the

system will also be available.

b. Automated Systems Approach to Training (ASAT) - ASAT is a training development software tool used to help developers produce and manage collective and individual training products. Among the many outputs are Mission Training Plans (MTPs) and Soldier Training Publications (STPs). ASAT is a fielded system currently undergoing a revision to make it Windows compliant and improve the functionality of the software. Steps are being taken to ensure that ASAT outputs to SATS 4.0 and receive feedback from SATS for consideration in revision of army training products. ASAT is the platform for making timely changes to collective and individual products. Using ASAT it will no longer take up to three years to revise a Mission Training Plan (MTP). These changes will be made to the database electronically, bypassing the slow and costly publication revision process of today.

3. Force XXI Infonet - The Infonet currently serves as the gateway for accessing selected Army data bases. These include the Automated Historical Archives System (AHAS), Combat Training Centers Warrior Information Network (CTC WIN), Center for Army Lessons Learned (CALL) databases, Force XXI database, and TRAMOD. Force XXI Infonet is a software program containing the necessary protocols and a menu system for entering the various associated systems is provided to the user.

4. Army Knowledge Network (AKN) - This system implements the TRADOC Commanding General's directive to " bring the Army's corporate knowledge through an easy-to-use GUI to every computer in every Army office, research center and TOC, and equip every user with the capability to retrieve, analyze, tailor and present sets of that knowledge". When fully developed, AKN will become the "library without walls". Building on the base provided by the Force XXI Infonet, it will be a key component of an interactive library which allows multimedia applications, storage and retrieval of doctrine publications, access to training development and training support applications, and access to a relational database.

4. CONCLUSION

As the Army enters the twenty first century it must transition to the technology provided by the "Information Age". The pace of change in information technology continues to quicken. Applications and functions not even envisioned in 1994 will be common place in 2010. Although impossible to predict what forms information technology may take in the future, we can provide a road map of how we wish to

proceed down the information super highway. Common architecture and interoperability must be the keystones of future Army information technology development. Emerging concepts such as the Land Warfare University and the digitized force are dependent on easy access to information. The Army can no longer afford the expensive, stand alone, stove pipe systems using proprietary architecture. We must capitalize on the use of continually emerging Commercial Off The Shelf software and hardware allow the Army to stay on the leading edge of emerging technology. Like today, the Army of the future will not be able to invest in hardware and software research and development and keep pace with commercial companies. We must leverage what they develop and adapt it to our uses. Above all, we must develop user friendly aids for the Total Army so we do not miss a golden opportunity to make some quantum leaps in improving the Army's systems.

CHAPTER 8

Execution

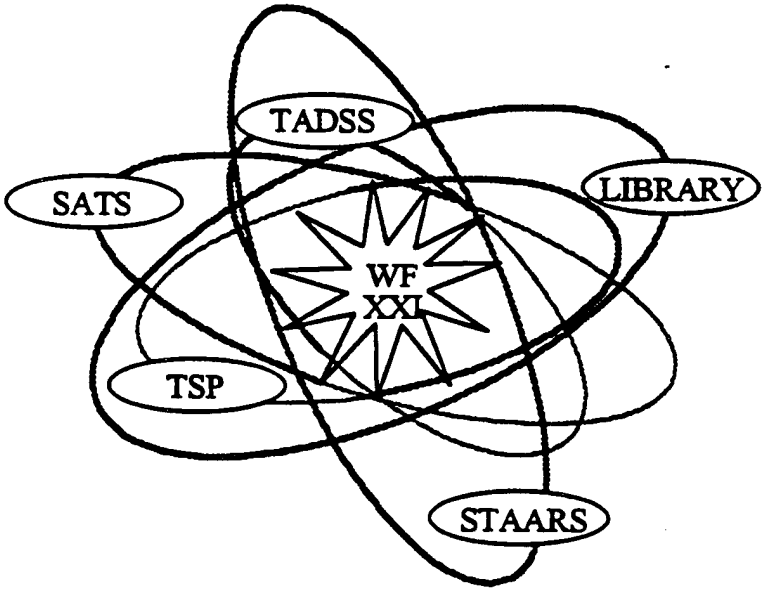
1. INTRODUCTION

The execution chapter is designed to provide a management structure for the Army to reach the vision for future collective training, while maximizing the use of all available resources. The Deputy Commanding General (DCG), Training and Doctrine Command (TRADOC) is responsible for the plan and its integration throughout TRADOC. The TRADOC the Assist Deputy Chief of Staff - Training (ADCST) is the executive agent for the development of WF XXI plan.

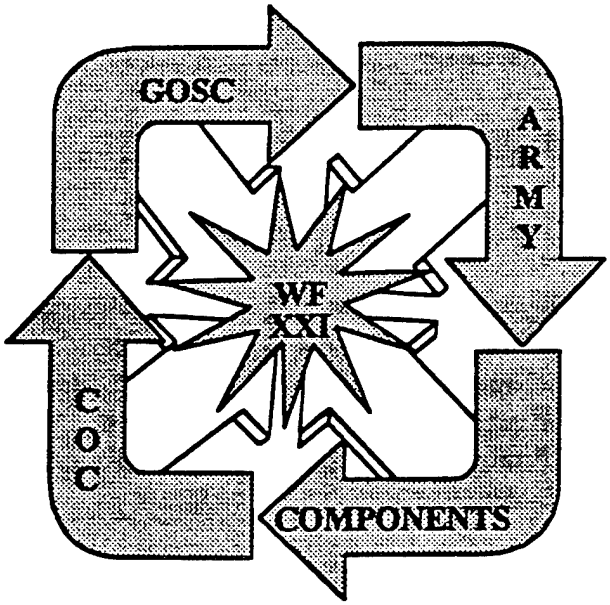
2. MISSION

Design and establish a management system, uniting both on-going and future efforts, to build the Army's training system for individual through JTF level training in the 21st century.

3. CONCEPT



In the development of the Warfighter XXI (WF XXI) Campaign Plan, five components key to the integration of training development and training pillars were identified. To manage these components a General Officer Steering Committee (GOSC) will be established with each member serving as a component commander with primary responsibility for one of the WF XXI components. To support the GOSC, a Council Of Colonels (COC) will be established with one or more colonels representing each GOSC member. The council of colonels will be supported by a matrixes organization representing all the Army's proponents for training, training systems and training development. It is envisioned this group will include both contractor and government members who work in training, training systems, training strategies, combat/materiel development of training systems or training development environments.



The GOSC members will provide leadership to each component, and guidance for integration and development of components to support future Army training. Additionally, the GOSC members will represent Army training issues in other Army forums providing command oversight, budgeting and integration of training across the Army.

To assist the component commander, a COC member(s) will oversee the day-to-day work of the component members and will chair the general component meetings and activities as required. Primarily, the COC will resolve issues within their component and/or resolve issues between components. Additionally, COC members will refine unresolved issues and present them to the COC corporate board for resolution. Unresolved issues or issues requiring additional guidance will be brought before the GOSC for resolution, guidance or their action.

To ensure decisions are timely, meetings of the GOSC will be scheduled prior to the budgetary meetings (Training Mission Area (TMA) GOSC, Combat Training Center (CTC) GOSC, etc.) in preparation for submission to the Program Objective Memorandum (POM) cycle. A requirement for two WF XXI conferences each year is envisioned to support two GOSC meetings. Currently, the budgetary meetings occur in early spring and late summer. To support timely decisions, WF XXI conferences and GOSC should meet in the January-February and June-July time frames.

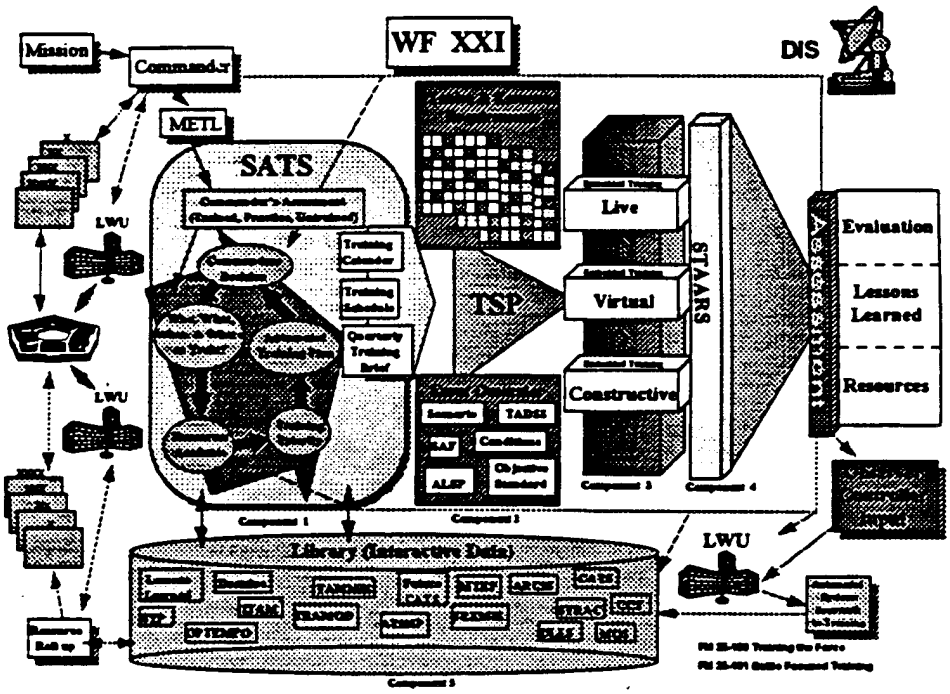
The WF XXI conference structure is designed to support the integration and resolution of Army training issues. The purpose of the conference is to exchange information between components, design the road ahead for Army training and identify issues for resolution at appropriate levels. The output from each conference will be an updated campaign plan reflecting the current state of the components and the milestones for the road ahead.

The agenda for the conference will be set approximately thirty days prior to the conference by the COC as it reviews critical issues for the near, mid and long term development of Army training. Each conference will be designed around a five day concept. Day one will provide a current status of Army training to all participants and provide for a working session by each component. Day two, three and four will focus on component integration sessions between each of the components to provide demonstrations of new or future training initiatives, programs, and systems; status

update of common objectives, work efforts and goals; and identify issues for resolution and future integration between components. The afternoon of day four will be dedicated to a component commander meeting to identify and assign issues for component resolution and to identify issues for presentation to the DCG, TRADOC. The morning of day five will allow preparation by each component of a 30 minute status report to be presented to the DCG, TRADOC during the afternoon. At the conclusion of the component presentation, the Battle Command Training directorate (BCTD) will present issues requiring additional guidance or resolution by the DCG, TRADOC.

4. CONCLUSION

The road ahead for the development of Army training is a rough one. The continual decrement of resources is forcing us to design new paradigms, integrate stovepipe structures, and break old "rice bowls" to form a systemized process to support total Army training. To be successful, we all must work together for the benefit of today's and tomorrow's soldier. The cornerstone of our Army's success, both today and in the past, has been the high quality training of our soldiers and units, we must ensure the solders of the 21st century are able to maintain this standard.



ENCLOSURE 2

CONVERGENCE OF TRAINING DEVELOPMENT AND MATERIAL DEVELOPMENT

Convergence of Training Development and Material Development

EMail from BG LON E MAGGART DCG USAARMC 02/07/95
Subject: C2V connectivity to Company

Quote...If we are to build the software packages that run on a specific hardware package in the back of the C2V or any other system for that matter, the software must support the transmission of the information necessary for the platoon, company, battalion, brigade, div and corps to fight the missions they have been given. Since fighting is really a manifestation of the tasks they must perform, the software must be capable of dealing with the tasks associated with each level of command.

Traditionally we have built such systems from the top down. Therefore no problem, so we think, with corps and div. However, if ..., without benefit of fully understanding the specific battlefield tasks required of the platoon, company, TF, Bde and yes, div and corps, they will NEVER design a software/hardware system that will meet needs of those who must fight, let alone those who must control it, ie bde, div and corps commanders.

Therefore, whoever (...) designs the software must understand in great detail at the platoon, company, TF and Brigade levels what information (to solve which specific tactical tasks) must be passed when, in what detail, and to whom for what purpose and what products before they will arrive at something approaching a solution that will allow the warfighter to successfully execute his battlefield tasks and beat the enemy. The same is true up the chain to div and corps since the lower level units are the agents for executing div and corps commanders' intent.

In the final analysis, the software that is used for training units to accomplish battlefield tasks is the same software that is used to execute battlefield tasks in combat. Think of it when training systems are embedded in the end item of equipment. The same software used to train is the same software used to fight....

End Quote

Italics added for emphasis

ENCLOSURE 3

MOUNTED MANEUVER BATTALION COMMAND/STAFF TRAINING: TRAINING POLICY, DEVELOPMENT, AND SUPPORT APPLICATIONS

12/27/94

Mounted Maneuver Battalion Command/Staff Training:
Training Policy, Development & Support Applications

Observations:

• Overall Bn echelon training proficiency is not as high as is relative proficiency at company and platoon echelons.[1] Most Bn Commanders do not "read the battle" (fingerspitzgefühl). Same observations apply across the mounted force - 1993-94 FORSCOM (5 Div-10 Bn NTC sample) and USAREUR (1 Div-3 Bn CMTC sample). Most battalion staff officers are not trained adequately to perform in a maneuver battle either in staff position tasks associated with plan, prepare, execute of explicit missions (MTC, DATK, DIS) or with integrating staff team tasks for the same missions (ex S2, S3, FSO, Engr team re barriers) - for understandable but unfortunate reasons: busy units (leaders); little warfighting Bn/Bde staff training in the institution; high staff turnover; lack of definition of staff tasks associated with mission performance; and commanders who don't know what they don't know re staff responsibilities (too little time in battalions as Lt, Capt, and Major).

• There is unhealthy staff preoccupation with planning (70-80% of effort) to preparation (15 to 20% of effort) to execution (10 to 15% of effort) that causes disturbing brittleness to enemy or friendly change once the order is issued. The conventional lore: in case of doubt, create another matrix - which will keep the OCs happy.[2] This may be clearly the proper response at division and above (the proper focus of Leavenworth), but it creates a dangerous emphasis on "poopsheeting" that threatens the KISS which enables accelerated tempo down at battalion. Many commanders seem to fear the fluidity of a maneuver fight - which Abrams/Bradley, nite vision etc. are designed to support.[3] Further, FM 71-123 appears to endorse extensive course of action analysis, wargaming etc at battalion which OCs dutifully review - after all, it's relatively easy to check! So OCs at CTC (NTC, CMTC) look for elaborate planning product OPORDS etc - all associated properly with deliberate operations but fatal to simple drills executed rapidly as the battle flows.

The subtle pressure to plan more and more is very strong and effective to the point that I suspect that to some, effective planning can become more important than mission success -

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[1] There are significant training problems at brigade echelon, generally recognized. Therefore my attention to battalion where I do not believe the deficiencies have been as clearly identified. Nor do my comments infer that platoons and companies are fully trained. The units I observed in USAREUR had not conducted Plt/Co ExEvals due to resource constraints. But the greatest relative training problem was at battalion. I'm not yet prepared to extend the observations to light forces. I will visit the JRTC Spring '95. Based on observation of Lt/Hvy at the NTC and a recent ARI study, however, I believe problems are similar.

[2] No criticism of OCs is intended, direct or implied. They are outstanding, a major asset of TRADOC and USAREUR. Their actions reflect what they are instructed to emphasize. That emphasis is what I believe is in error. They reflect a very knowledgeable school of thought which believes that deliberate is "crawl" to hasty as "walk/run". I disagree. I believe there is a "crawl,walk,run" for deliberate and another for hasty. Procedures are different.

[3] The lore of the NTC is full of situations where a commander faced with significant pre H Hour change in the friendly or enemy situation did not modify his plan - the apparent victum of a brittle tactical decision-making process.

after all we all lose to the damned OPFOR. "Did we lose despite good planning perceived by the OCs?" can become the Measure of Performance not " Killing the OPFOR isn't the only thing, it's everything".

Being against good planning is like being for sin. It's a rare battalion commander exposing his career at a CTC who will not accede to OC pressure to plan better even at the cost of focus on rehearsal for execution or preparing for the inevitable change which will occur during execution. Recall Marshall's concern re the process focus at Benning in the Thirties. The US Army seems to be there today at battalion.

The OC doctrinal checksheet aka the tactical decision-making process, reinforced, and the "dance" of Mission, AAR, Mission, AAR at the NTC and CMTC exacerbate the problem. Aggressive, competent, well-meaning OCs ask for more and more detailed planning to compensate for general lack of Battle Command Staff Training (BCST). In my company/battalion service under Abrams and DePuy, no written product was expected at battalion; FRAGO and graphics were simple and extraordinarily expressive of the commander's intent (as OPFOR graphics are today). That is not the current conventional wisdom. A serious challenge may become a grave problem as the tempo picks up per the latest 525-5 as enabled by horizontal integration.

Bottom line. The tactical, mounted Army is not trained today as well as it should be at the battalion echelon considering the very heavy resources being put into the CTCs and the time devoted to unit prep and execution at a CTC. A hard look needs to be directed at mounted force command/staff training - scrub NTC and CMTC processes as well as the pre and post CTC training.[4] Excellent work has been done on the larger issues of collective training in units by ARI in a recently published, widely distributed book. Consider the following to be general thoughts in extension of this fine ARI effort by Dr Jack Hiller et al. [5]

Assets:

The Army's assets to support battle command and staff training are very considerable. Their application is less impressive. As the DCST, TRADOC when the NTC was created in the early Eighties and therefore responsible for implementation of a comprehensive, effective training strategy, I assert that little has changed over the years to reflect either new mission requirements or new training support which has become available.[6] So, the way the CTCs train battalion command/staff today may be right but the odds are low that this is the case. This is a perplexing issue when training support is so plentiful to enable change responding to new requirements.

The Army has a remarkable inventory of training resources:

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[4] The importance of solid homestation training is clear. Very tough to compensate at a CTC if there has been little homestation prep. But officer staff training is not limited by conventional OPTEMPO constraints. Battalion Commander and staff time to train is vital to improved BCST. An excellent review of the CTC process initiated by BG Pat O'Neal *A Proposal for the Future of Our CTCs*, is now followed by a DCST,TRADOC *CTC Future Actions Plan.* Neither effort focuses specifically on the general issue of improving battalion echelon BCST.

[5] Holtz, Hiller and McFann. *Determinants of Effective Unit Performance* . USARI 1994.

[6] Serving as the Chief of Armor in the mid Eighties, I recall concern about inadequate reconnaissance. Therefore Recon/Counter Recon was emphasized at the NTC, to beneficial effect. Then, there was concern that too many commanders were"winging it" practicing violent execution without the preceeding deliberate planning. The Army clearly overcorrected in this area.

+a full and growing suite of battle simulations all of which can be left "free play" as at present or structured to cause highly explicit and replicable command and staff training to occur. Now Synthetic Theater of War (STOW) emerges to expand this capability to mold tactical engagement simulation (TES) to support very focused training and evaluation. STOW should permit synergistic combination of already excellent simulations.

+a corps of OCs tactically and technically competent to train at CTC as well as rewrite doctrine, TTP, mentor commanders and staffs, or .... They and SAMS are the "crown jewels" of TRADOC.

+OPFOR - an expensive but exceedingly effective training aid but which in practice is often left "free play" to "do its thing" to the detriment of training of the unit in rotation. The purpose of OPFOR action should be to create precise training effects desired by the OCs. It may keep morale up in the OPFOR to have a free fight but it's a serious waste of expensive, unique capability to create warfighting cues which cause most any battalion training to occur. Nothing the OPFOR does should be left to chance including a decision to permit OPFOR "free play" .[7] OPTEMPO cost is too high to waste today in relation to total assets available to the Army.

+Improved instrumentation. The Army can now keep track of much more data than it may know how to use. More is clearly better but why and how? What explicit improvement in training is it causing particularly in support of pre and post CTC training?

+Structured BCST training (SIMUTA) has now been created for ARNG. It could be used or modified and used to create a rigorous regime of BCST training in the basics comparable to that developed over the years to support AFV training.

+There are numerous highy competent former OCs available to be hired to supplement OC expertise to execute new training opportunities, particularly mentoring of battalion commanders and staff.

+An outstanding NCO corps has been created which is fully capable of "taking charge" of the battalion during extended periods at homestation so the leaders could learn how to fight the battalion.

So there really is a wide array of new capabilities available now. Why is there such a continuing problem of battalion BCST competence? Some possible reasons are suggested above. There may be more. Perhaps officers (commanders and staff officers) in a highly competitive shrinking force don't wish to be evaluated on their basic tactical competence in the uncertainty of maneuver war? Perhaps the loss of the focus of GDP-the "Battle Book" has eroded tactical technical competence? Most likely, perhaps the Army just hasn't had the opportunity to think through how the CTC process, including pre and post training, might be changed to "fix" battalion echelon training proficiency.

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[7] OPFOR freedom is essential to the credibility of the CTCs. The challenge is to vary OPFOR METT-T (correlation of forces etc) to "design" probable outcomes to achieve the desired training effect for the unit in rotation. Within those METT-T constraints, the OPFOR operates freely.

Suggestions:

In any event, several new opportunities and requirements need to be considered in assessing homestation as well as CTC futures in support of improved BCST: Several of these may take years to enable. So did the building of the mounted force company and below in the Eighties. Is now the time to lay out a comparable program for BCST? Time to establish explicit requirements to focus emerging training support? The following may suggest "a way" to start: [8]

+The first and probably the most important single decision is to reinforce BCST with a framework of rigorous structured training - training to explicit staff task, condition and standard (TCS) comparable to that associated with training at platoon or company. I believe that the complexity of current doctrine and TTP mandate that training of the command and staff basics include not only TCS definition but also an opportunity to observe a competent staff individual or team perform the task - to observe "a way". NOT "the only way", NOT a "school solution" but "a way" to very detailed Measures of Performance. The essence of training then becomes one executing "your way" to the same METT-T preserved in detail in TES. The AAR assesses "your way" contrasted to "a way". As soon as one demonstrates proficiency, the METT-T are changed. "What Ifs" and staff STX proceed. The structured staff training proposed is both prescriptive and descriptive. It is prescriptive in that proficiency must be demonstrated in the basics in uniform staff Tables(Modules); descriptive in that once basic proficiency is established, staff training to force projection METL is expected. [9]

+The CTC could be just one part of a training process; a flow of training extending from homestation to CTC back to homestation. At a minimum, specific commander and battalion staff warfighting expertise (trained and evaluated to TCS) should be expected as a precondition (Gate) to attendance at a CTC[10] . Can the staff produce a hasty frag order? Do the S2, S3, FSO work as a team to focus direct and direct fires on an EA created as an unanticipated opportunity during execution? Are JAAT procedures understood and capable of timely hasty execution etc.? TES (STOW) could be molded to permit demanding task-based homestation BCST. And BCST training priorities reinforced by the chain of command so battalion command and staff have time and motivation to train.

+The Army has spent considerable resources to create training support which provide effective AFV and mounted platoon proficiency training - COFT, PGT, MPRC. What comparable focus of resources exits to cause battalion training to occur institutionalized in structured exercises (Tables and STX) shaped to cause most any combination of TCS to be trained? How many repetitions of what staff training Table or STX are necessary to train basic command and staff skills for MTC or....?

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[8] These are broad thrusts. Some may not be appropriate. Only those with the perspective of actual responsibility can determine.

[9] The key issue is to establish a rigorous task-based commander and staff training program then enforce it. For more elaborate description of "one way" to address staff officer proficiency, see: F.J.Brown *Training Third Wave Landpower: Structured Training.* IDA P 2947. December 1993.

[10] I acknowledge the great sensitivity of establishing officer proficiency "gates"- currently not done. Yet if US staff officer proficiency isn't assessed, how can the Army ensure basic staff task proficiency or assess that of other nationalities joining for JTF or CTF operations. Or how is proficiency to be confirmed to operate command and staff data appliques for Abrams, Bradley etc in TF XXI?

+ What tutorials are there for the maneuver commander who simply can't "read the battle" - as observed by his chain of command at a CTC? Who will use distributed TES training support to take him (or the S3 or the S2,S3,FSO) through fifteen or twenty MTCs until he really understands the flow of a maneuver fight, and how his combat multipliers can be used? The Army has similar highly individualized training available for the AFV commander or platoon leader (COFT,PGT,Rg 301). Why not something similar for his battalion commander or staff majors? Should the Army hire retired highly competent Bde/Bn OCs to use distributed TES to"coach" the Bn Battle Command team between the LTP and the CTC rotation? Are there better alternatives to support extensive staff training?

+ How is training support focused to permit the Battalion Commander and his staff to "fight" crawl, walk, run missions before coming to the CTC - twenty or thirty "fights" executing with both enemy and friendly situations changing rapidly. STOW and similar TES which enable this or demonstration of explicit staff team proficiency (JSEAD, JAAT, Counterfire) are here or coming. How to use to improve Bn level warfighting profiency? What's the plan? How should a mission fought in TES at home or at BBS/Warlord be translated to the ground in actual mission so the commander can validate the proficiency gained (or not gained) pre-rotation?

+How might the CTC rotation be modified to encourage battalions to fight a free-flowing maneuver fight? Rather than repetition of deliberate missions reinforcing the need for detailed planning broken only by frequent AARs, design the training for multiple hasty missions non stop for 48 or 72 hours. Meter the OPFOR to the correlation of force appropriate to explicit training objectives for the battalion. Then pause to refit and AAR in depth. Then how should this be changed as digitization proceeds?

+Review battle command decision making doctrine and TTP for Bn. Simplify. Rather than relay on matrix upon matrix, train battle commander and staff to execute simple maneuver action drills backed up by comparable drills for Arty, Engr, CSS etc. Simplify then speed up. Deliberate decision processes need to be trained. Detailed planning is a precondition of successful Force Projection but these processes should be trained at homestation backed by the education and training of the institution not primarily at the manuver CTC.

There are no easy answers. Readers more tuned to today's requirements will have better ideas how to fix this problem once they understand that the status quo is recognized as needing correction by senior Army leaders.

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cf Senior Army leadership

ENCLOSURE 4

EXTRACT:
BRIDGING THE GAP THROUGH TRAINING STRATEGIES

ENCLOSURE 4
EXTRACT:
BRIDGING THE GAP THROUGH TRAINING STRATEGIES

... The potential second training revolution can be shaped to increase effectiveness by a factor of two or three by training likely warfighting tasks much better than they are trained today. It can achieve comparable increases in efficiency by enabling equal or more individual and collective training to TCS with fewer resources than are required today.[1]

This is no nirvana, no perpetual energy machine. New investments will be required. There is risk. But there are genuinely significant changes possible in the effectiveness and efficiency of individual and collective training in institution and unit which are both desirable and feasible. The potential impacts can be nationally significant. For example, the changes I describe might:

+ make Cat IIIB personnel as trainable as Cat IIIA or perhaps convert Cat IIIA into Cat II potential soldiers;

+ train ARNG captains and majors to levels of personal proficiency in the warfighting TCS of control that are equal or higher than those of their active compatriots who are not assigned repetitively to high priority tactical units;

+ intensify predeployment training strategies to develop cohesion and collective task unit training proficiency to TCS within *ad hoc* units such that current priority to leader and individual development over unit personnel stability can be sustained in other than in the highest priority units.

Those three examples are the tip of the iceberg of what may be possible. They would seem to be clearly desirable; but are they feasible? I leave that determination to the reader. To assist in judgment, I describe several likely improvements in both effectiveness and efficiency:

Increases in effectiveness (trains warfighting tasks better):

Train more detailed individual and collective TCS better.

To date there has not been a detailed description of the TCS required to execute common missions, particularly at battalion and above. Some work has been done to identify individual and group staff tasks by echelon (battalion, brigade, division); there has

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1 These are order of magnitude changes possible as a byproduct of the ARPA Advanced Distributed Simulation programs which are regarded by some as the next major ARPA advance analogous in national importance to Internet and Stealth.

been practically no development effort tied vertically to battlefield function (Battlefield Operating System [BOS] such as fire support). There are Mission Training Plans which describe general staff section responsibilities, but they are quite vague. Now a much more precise taxonomy of BOS is being created—the draft Critical Combat Functions. They define in detail *who* must do *what*, *when* to cause actions to occur on the battlefield. That detail, when applied to the training infrastructure at the CTCs—the OCs, AAR and better Instrumentation Systems ... —will permit much finer resolution of exactly what it is that must be trained than has been provided to date both vertically and horizontally. With the resolution of TCS combined with improved taxonomy come precision of focus of the processes of training. There is not only new training, never before defined, but also much better definition of the old. *More effective training.*

Train tasks previously untrainable.

Small unit training, particularly that of mounted maneuver units has for years focused on training to superior performance on increasingly complex live fire ranges. The best, for years, was Range 301 in Grafenwoehr. Practically all other training was designed to improve Range 301 performance. Yet Range 301 remains a poor replica of the totality of tasks which could be expected in combat. Limited by safety, ecology and cost, the range was like a bowling alley. Artillery was employed sparingly as were attack helicopters. TES now provides the capability to train all of the likely combat tasks - 360 degrees, with as much artillery, or engineers or electronic warfare or attack helicopters as might be expected in any contingency operation.[2] Many more combat tasks are now possible to train under great variations in conditions. *More effective training.*

Ability to meter training to audience

TES provides capability to vary the tasks or the conditions of training. Described as "crawl, walk, run" training, the theory is to gradually increase the difficulty of the tasks being trained or the conditions of the fight based on assessment of individul or unit performance. It is now possible to vary the training cues in TES to desired training effect such as day to night, adding CBR or increasing the quantity or quantity of opponents.

Probably the best example of this is the Unit Conduct of Fire Trainer (UCOFT) which diagnoses vehicle commander and or gunner performance on an Armored Fighting Vehicle (AFV), then prescribes remedial exercises designed to develop increasing task proficiency to standard. Easy to create exciting experiencial training in virtual or constructive simulation, it can also be done with live simulation (MILES) although with more difficulty. *More effective training.*

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2 There is no question whatsoever that live fire is necessary to train combat forces. The point is that it is not sufficient. There are simply too many combat tasks too unsafe (fraticide danger), too costly (brilliant combat munitions) or too ecologically unsound (Depleted Uranium [DU] ammunition) to train in live fire in peacetime. The issue is when is live fire supplemented by what for which purposes?

Train in distributed locales while retaining quality control.

Here the power of distribution really combines with that of TCS and TES.... TES permits the creation of a demonstration "a way" of either individual or collective training with absolute verisimilitude from one trial to another. Using networked simulation on the Defense Simulation Internet (DSI), that absolute verisimilitude can be recreated anywhere in the world. Performance can be assessed of the individual or unit in training executing the same mission to identical enemy, terrain and time available as was executed by the demonstration individual or unit. And the detail of TES permits development of very detailed Measures of Performance. Proofed in maneuver platoon and company training in Simulation in Training for Advanced Readiness (SIMITAR) for two hi-priority brigades in the Army Guard, that intensive structured training is now being provided to forces in Europe. It has been expanded to battalion and brigade echelons for three missions at the NTC. *More effective training.*

Train staff officers and staff teams in explicit TCS

The capability described next above really shines when the purpose is training commanders and staff officers in new TCS of control associated with Force XXI Operations as expressed in TRADOC Pam 525-5. As precise vertical and horizontal TCS are defined in evolving doctrine, tactics, techniques and procedures, "a way" demonstrations can be created using existent training infrastructure to develop then define tasks with precise MOP and MOE which can be available for detailed officer training. Those demonstrations can become the primary training support for training staff officers individually and as teams both in the unit and in the institution.

At the same time, a capability is being developed to warfighting competency base officer proficiency. In other words, the demonstrations can become uniform warfighting scenarios to used to train and assess officer tactical warfighting proficiency in the TCS of control. *More effective training* but very little done to date.

Train responsive to turbulence and turnover.

Many of the training improvements of the past several decades have been directed at ensuring that the correct tasks were being trained to standard. Now there is both challenge and opportunity to expand focused, turnkey, structured training to support requirements for increased frequency of training. In other words, use technology to make faster, more frequent training easier.

Substantial progress has been made. The UCOFT was designed to accommodate high turbulence and turnover by fielding a "training machine" available to bring rapidly new vehicle commanders and gunners to objective levels of proficiency. It works. New AC Abrams tank crews are quickly proficient on tasks trained in UCOFT. When a structured weekend training program was designed for implementation at Ft Knox - Simulation-Based Multiechelon Training Program for Armor Units (SIMUTA) - a design parameter was to

compress one normal week of Annual Training into a long weekend on SIMNET at Knox. This was done.[3]

It is now possible to use TCS and distributed TES to create very intensive distributed structured training which is effective despite high levels of turbulence and turnover. *More effective training.*

It is difficult to assess what the combined effects of these measures can be on individual and collective training. When important warfighting tasks are being trained which have been heretofor undefined or untrainable, there is very great improvement. And really very little has been done to date in most of the areas suggested. I believe that a two to three fold improvement in effectiveness particularly in collective training is a low-end expectation if all the actions suggested were to become resourced programs. Now, what about efficiency?

Increases in efficiency (equal or more training to TCS with less resources):

Compression of training.

There are numerous opportunities for compression of training for those tasks which can be trained in virtual or constructive simulation. The set up costs for the unit are much lower.[4] The administration and maintenance associated with range set up, target replacement, range safety and the myriad of other details disappear. Often, as in ARNG structured lane training, employment of a trained Opposition Force and knowledgeable Observer Controllers can permit substantial compression. Normal lane training requires three or four hours for one platoon training event. In TES, three or four similar events can occur in the same period. Use of structured interactive immersion compressed warfighting tasks normally associated with one week of annual training into five Unit Training Assemblies at Ft Knox. *More efficient training.*

Distribution of training.

For the first time, it is becoming possible to literally bring the training to the soldier rather than the soldier to the training. New small unit staff training is prepared today on CD ROM so it is available at home station or armory—and ultimately to the kitchen table—while retaining quality control. Distributed virtual simulation permits widely dispersed units to train together on complex digital battlefields. Attack helicopters flying from Alabama routinely engage in combat with Abrams and Bradleys maneuvering on a digital battlefield at Ft Knox. Similar interactivity is possible from the United States to forces on the ground in Germany, as demonstrated last year at the CMTC.

Complex battlefield interactions can be brought together to create highly realistic battlefield cues for training as well as for mission rehearsals on digitized terrain. The

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3 A significant achievement by the Armor Center and the Army Guard but very capital intensive—both manpower (OCs) and simulation (SIMNET and JANUS).

4 In many cases, compression shifts the cost of training away from the unit in training generally to a higher echelon which must design then structure the training. Therefore clear efficiencies to the battalion and below may not be theater level efficiencies.

necessary simulation and distribution technologies emerge in the civilian telecommunications, entertainment, and education industries. Others will develop the distribution networks. *More efficient training*

Extension of period of effective training.

Current training practice is to create a unique scenario for about every training event. The individual or unit studies the scenario and immediately forgets it as the training exercise ends. The effective period of training is thus limited to the period of active participation. Why not create a common on-going warfight available in simulation so the period of effective training can be extended? Create a "flow" of training (pre to execution to post) so individuals and teams know the general situation and, as motivated, can train together prior to the unit training, then continue to discuss and "what if" after the formal training period has ended.

As training is developed to a more precise taxonomy (BOS expanded into CCF) with cueing of training to specific tasks increasingly feasible, it would seem that there could be considerable extension of the period of training. Add to that the ability to tie forms of TES to create increasingly complex common training scenarios which could be "crawl" in CD ROM at home to Simulation Networking (SIMNET) or Brigade/Battalion Battle Simulation (BBS) at homestation or armory to "walk" to same tasks on the ground at CTC. The period of effective training would have been increased considerably using a common scenario across complementary TES. *More efficient training.*

Determination of precise, high value training requirements.

Solid initial work has been done in this area. Analysis of small unit warfighting tasks initiated more than a decade ago revealed that there are important tasks which are part of several missions. Thus, concentrating training on those high value, high frequency tasks provides multiple mission readiness. For example, the three ground maneuver missions of Deliberate Attack, Defense in Sector and Movement to Contact contain over 70% of the collective task inventory for maneuver units. It pays to focus training on these three missions. That is the focus of the intensified Army Guard training. *More efficient training.*

Congruence of training through vertical "nesting".

Another potential economy in training is the development not only of the common scenarios suggested above but also their design such that lower echelon is nested in higher. Company is a subset of battalion which is a subset of brigade, in turn a subset of division, then corps. Same sequence for joint tasks. The purpose is to create vertical task congruence so that tasks executed at the lowest echelons can be tracked vertically as high as necessary in order to permit vertical task definition then training. For example, a target designated by a brigade laser team can be tracked all the way up to the corps Multiple Launch Rocket System (MLRS) unit which actually fires the mission. Or the radio intercept acquired with a maneuver battalion can be tracked to theater intelligence. In both

cases, that resolution is necessary to define exactly what who must do when to cause fire support (or effective intelligence) to happen.[5] This vertical congruence combined with common scenarios should provide common horizontal and vertical warfighting training experiences which can be drawn upon to refresh basic task proficiency in *ad hoc* functional force projection organizations as they undergo intensive training to the Mission, Enemy, Terrain, Troops Available and Time of the actual mission. *More efficient training*.

... There are genuinely new training capabilities available to be exploited and there are several new ways of doing business which can support dramatic improvements in training. Both new capabilities and better processes combined with imaginative training advances offer a substantial prospect of significant increase in both effectiveness and efficiency of training in the near future. We have discussed these above. The combined impact of these improvements in effectiveness and efficiency could be substantial. So improved training may provide solid relief should a serious gap emerge between Service demand and accession supply....

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5 That same rigor defines the requirements for effective digitization both horizontal and vertical.

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This study reviews current training development practices as the Army moves to exploit the advantages of distributed Tactical Engagement Simulation to Force XXI Operations (Army doctrine for warfighting in the Information Age), particularly those relating to individual and collective training in Army units. The study proposes explicit policies to address anticipated training development requirements. This is the fourth paper in a study undertaken to increase effectiveness and efficiency of training. The first study (IDA P-2611) was limited to U.S. Army National Guard Armor Units, Company and Below. The second study (IDA Paper 2785) proposed training policies and programs for Total Force Maneuver Battalion and Brigade staffs concurrent with ARPA development of appropriate technologies. The third study (IDA Paper P-2947) proposed a new framework for structuring training to exploit new capabilities—a framework now embedded in the Training Support Packages (TSP) of Army Warfighter XXI. The current study describes needed training development to create training programs for the Total Force.

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